Comments on the
Draft Nox Control Policy
for Combined Cycle Turbines

List of Commenters on the Draft Guidance on BACT for Nox Control at Combined Cycle Turbines with Comments

Document #	Date	Commenter
1	9/6/00	Neil Turner, President, Citizens Advocating Responsible Development
2	9/6/00	Verena Owen, 421 Ravine Drive, Winthrop Harbor, IL 60096
3	9/6/00	Gerald H. F. Gardner, Professor Emeritus, Rice University (9/3), Group Against Smog & Pollution
4	9/8/00	Robert J. Morehouse, ExxonMobil Chemical Company
5	9/11/00	Wayne Kitchen, Vice President Regulatory Affairs, Western Resources
6	9/12/00	Manfred Klein, Chair IGTI Environmental and Regulatory Affair Committee, International Gas Turbine Institute
7	9/12/00	Jeffrey C. Smith, Executive Director, Institute of Clean Air Companies
8	9/13/00	Jason M. Goodwin, P.E., Senior Engineer, Air Resources Division, Environmental Department, Wholesale Group, Reliant Energy
9	9/14/00	Katherine S. Poole, Adams Broadwell Joseph & Carbozo on behalf of the California Unions for Reliable Energy (CURE)
10	9/15/00	Leslie Witherspoon, Manager, Environmental Programs, Solar Turbines, Inc.
11	9/15/00	David Shaw for Robert Warland, P.E., Director, Division of Air Resources, NY State Department of Environmental Conservation
12	9/18/00	F. William Brownell & Graig S. Harrison, Hunton & Williams on behalf of the Utility Air Regulatory Group (UARG)
13	9/18/00	Marc N. Phillips, Manager, Regulatory Technical Analysis, Environmental, Health and Safety, Enron Corp.
14	9/18/00	Peter D. Venturini, Chief, Stationary Source Division, California Environmental Protection Agency Air Resources Board
15	9/18/00	Patricio Silva, NRDC (revised version w/23 names)
16	9/18/00	Randy Raymond, Missouri Air Pollution Control Program, Permit Chief
17	9/18/00	Robert S. Kripowicz, Acting Assistant Secretary, Office of Fossil Energy, and Melanie A. Kenderdine, Director, Office of Policy, Department of Energy
18	9/18/00	Joel Bluestein, Energy and Environmental Analysis, Inc. for the Coalition for Gas-Based Environmental Solutions

19	9/18/00	Chuck Solt, Catalytica Combustion Systems Inc. (CCSI)
20	9/18/00	Mike Opalinski, Chair, FCG Environmental Committee, Florida Electric Power Coordinating Group, Inc. (FCG)
21	9/18/00	P. F. Fagget, Dominion
22	9/18/00	Allan F. Bedwell, Vice President, Goalline Environmental Technologies
23	9/18/00	James C. Colman, Assistant Commissioner, Bureau of Waste Prevention, Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Department of Environmental Protection
24	9/18/00	Glenn Landers, Sierra Club Cleveland Office
25	9/18/00	John Paul, ALAPCO Chair, NSR Committee & Bill O'Sullivan, STAPPA Chair, NSR Committee
26	9/18/00	John Bunyak, Chief, Policy, Planning and Permit Review Branch, National Park Service and Sandra Silva, Chief, Air Quality Branch, U.S. Fish and Wildlife
27	9/18/00	John Paul, Supervisor, Regional Air Pollution Control Agency (RAPCA)
28	9/18/00	John Rice, Executive Vice President and Chief Operating Officer, GE Power Systems
29	9/18/00	Michael W. Stroben, Manager, Corporate EHS Technical Analysis, Duke Energy
30	9/18/00	Samuel Wolfe, Environmental Policy Manager, Environmental, Health & Safety, PSEG
31	9/18/00	J. Michael Geers, Cinergy Environmental Services
32	9/18/00	William, O'Sullivan, P.E., Administrator, Air Quality Regulation Program, NJ Department of Environmental Protection
33	9/18/00	George A. Schott, Manager, Systems Integration and Environmental Engineering, Siemens Westinghouse Power Corporation
34	9/18/00	Lynn H. Church, President, Electric Power Supply Association
35	9/19/00	Costello Martin, Department of Environmental Protection, State of Florida
36	9/19/00	Gale Henslee, Environmental Project Lead, Xcel Energy Services
37	9/20/00	D. L. Beck, Texaco Power & Gasification
38	9/20/00	Barry G. Young, Principal Air Quality Engineer, Bay Area Air Quality Management District

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Document 1

Our organization vigorously opposes the proposed change to EPA regulations allowing dry lonox technology to be used without NOx reduction equipment such as SCR or SCONOx

Neil Turner, President
Citizens Advocating Responsible Development
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Document 2

VERENA OWEN

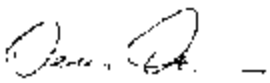
421 Ravine Drive, Winthrop Harbor, IL 60096

September 6, 2000

Mr. John S. Seitz, Director
6301A
USEPA Headquarters
Ariel Rios Building
1200 Pennsylvania Ave.
Washington, DC 20460

Dear Mr. Seitz,

Thank you for the opportunity to comment on your draft guidance memorandum on the use of SCR fro dry low NOx combined cycle turbines.
With the astonishing proliferation of permits for electricity generating facilities in Illinois, I had plenty of opportunity over the last yew to review and comment on both state construction permits and PSDs that use simple or combined cycle turbines.
There are several aspects to your memorandum and the technical background document that I find troubling.
1. One of your arguments is that the added on cost of SCR would make the plants less attractive to run. You state that electric power is dispatched generally in the order of the lease expensive first. Combined cycle plants are base load plants. They are not designed to operate "on in periods of peak demand." Many of the base load plants have long term contracts and have replaced the importance of coal fired plants that are now uses as intermediate plants. Base load plants cannot quickly react to changes to the cost of producing electricity.
2. There is no guarantee that combined cycle plants will in the future product electricity cheaper than steam generating units. This will not depend on the cost of SCR as much as on the cost of fuel. The price for natural gas has already doubled.
3. You make no clear distinction about the different add-on technologies. While some SCRs use ammonia others do not. That is misleading
4. While you argue that in the BACT interpretation by the Environmental Appeals Board the release of pollutants has to be addressed, the Board also said that the removal of pollutants has to be given consideration. SCONOX technology removes/reduces among other thing formaldehyde, a pollutant that is of concern for gas-fired CTs.
5. If the USEPA is so concerned about collateral impacts from ammonia slip, would not the logical step be to better monitor the SCR? Why has that not been done if the problem is so well known and described? To expand the life span of SCRs and minimize ammonia slip why do you not require them to run only during the ozone season?
6. Your guidance clearly favors one company, GE, over all other makers of combustion turbines. I have always believed that competition is the mother of many inventions. Your guidance stifles any further research into improving DLN technology.
7. Why do you call the reduction of NOx from DLN CC CTs' emissions from 9 p.m. to 2.5 to 4.5 or to less then half(!) " a modest benefit in terms of NOx reductions"?
8. The USEPA should NEVER settle for good-enough or low-enough when it comes to air pollution.

Sincerely  ,

Document 3

GASP

Comments on the Draft Guidance Document "Consideration of Collateral Environmental Impacts Associated with the Use of SCR at Dry Low NOx Combined Cycle Natural Gas Turbines" (a Federal Register notice of availability dated August 17, 2000, 65 FR 50202)

GROUP AGAINST SMOG & POLLUTION

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Sept. 6, 2000

This Draft Guidance Document discusses the pros and cons of requiring SCR to reduce NOx emission to less than 5 ppm for combustion units that emit about 10 ppm without SCR. It is backed-up by a Supporting Document titled "NOx Control on Combined Cycle Turbines" which gives more general background information.

Unfortunately the discussion is not even-handed, but is biased towards not requiring SCR.

1. The conversion of NOx to ozone is not a linear process. At low concentrations of NOx the conversion is more efficient. Thus a reduction from 10 ppm to 5 ppm. reduces ozone more than a reduction from 15 ppm to 10 ppm, or from 20 ppm to 15 ppm. It is more important to reduce NOx at low concentrations. This non-linear effect argues in favor of requiring SCR for DLN turbines.

The non-linearity is described in the Supporting Document. No mention of the effect is made in the Draft Guidance Document.

2. The Draft Guidance Document makes an economic argument that requiring SCR for DLN turbines would actually increase pollution because it would cause an increase in production from more polluting plants. This argument is described in detail in the Supporting Document. The analysis relies on the Integrated Planning Model (IPM). However, this model does not include the effect of Customer Choice such as is available in Pennsylvania and other states. There, customers may choose to pay more for electricity in return for the promise that it is generated in a clean way. Thus electricity from a DLN turbine with SCR can sell for more than electricity from a DLN turbine without SCR. This fact is not taken into account in the modeling. Green Mountain is an example of a company that charges more than most companies but does what it can to use non-polluting sources.

The EPA should require the same interpretation of BACT for all plants without exceptions, and let the market place under deregulation take care of supply and demand.

3. Both the Draft Guidance Document and the Supporting Document discuss various chemical reactions that occur in the atmosphere but neither discusses the physics of combustion and the creation of NOx. It would be useful for everyone to have a clear analysis of how control of the in the combustion zones affects the generation of Nox.

Sometimes this is done by staged combustion, sometimes by burner design. A summary of the latest theory would enable permitting agencies to ask pertinent questions about the applicant's combustion controls.

4. The Draft Guidance Document does not make it clear that reducing the concentration from 10 ppm to 5 ppm. simplifies SCR compared with reducing the concentration from 25 ppm to 5 ppm. A quarter as much dry precipitation must be caught and disposed of, a quarter as much catalyst is required, and almost a quarter as much ammonia slip is generated. Labor costs and capital costs are less. It is not a great burden to require SCR for DLN turbines.

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Professor Emeritus, Rice University
September 3, 2000

Document 4

ExxonMobil Chemical Company
Safety, Health and Environment
13501 Katy Freeway
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ExxonMobil
Chemical

September 8, 2000

Ms. Pamela J. Smith
Information Transfer & Program Integration Division
Office of Air Quality Planning & Standards
U.S. EPA
Research Triangle Park, NC 27711

Re: Draft Guidance on BACT for NOx Control at Combined Cycle Turbines

Dear Pamela:

ExxonMobil Chemical Company (EMCC) appreciates the opportunity to submit comments on the Environmental Protection Agency's (EPA) August 17, 2000 "Notice of Availability for Draft Guidance on BACT for NOx Control at Combined Cycle Turbines." EMCC is a major petrochemical producer with 15 manufacturing sites in the U.S. Turbines are an integral part of our operations and power supply at several sites, and we continue to evaluate future turbine projects due to the economic efficiency and environmental benefits associated with these projects.

Applicability: The guidance should apply to dry low NOx combined cycle and cogeneration natural gas turbines at industrial facilities.

The guidance currently states, "This guidance does not apply to other types of facilities or other types of electric power generating plants." We have interpreted the guidance to apply only to the utility industry. EMCC currently operates cogeneration (electricity and steam) facilities and is evaluating further use of dry low NOx (DLN) gas turbines. The environmental factors to be considered in making a case-by-case BACT determination for utility industry DLN combined cycle turbines are equally applicable to combined cycle and cogeneration operations at industrial facilities. Whether a turbine is in a chemical plant or at an associated utility that provides steam and power to the chemical plant should not make a difference in a BACT analysis. EPA should continue to encourage the use of pollution prevention technologies such as DLN combined cycle and cogeneration gas turbines. To summarize, EPA should modify the guidance to apply to dry low NOx combined cycle and cogeneration natural gas turbines at industrial facilities.

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BACT Analysis: EPA should modify the guidance to eliminate the presumptive nature of Selective Catalytic Reduction (SCR) as BACT for the DLN combined cycle turbines.

EPA currently states, "In most cases best available control technology (BACT) for controlling NOx emissions from combined cycle natural gas turbines used to generate electricity is a concentration that is achieved by selective catalytic reduction (SCR). This is true at all combined cycle natural gas plants including those that use a variant of the technology called dry low NOx turbines that can achieve less than 10 parts per million NOx emissions without add on controls." The second sentence creates a presumption for SCR, with the result that the environmental factors discussed in the guidance would have to be countervailing factors to justify not requiring SCR. EPA should modify the text to allow a more balanced assessment of the environmental factors and cost considerations (particularly with retrofit SCR at existing facilities) when determining BACT for the DLN combined cycle turbines. Also, the 10 parts per million" should be referenced to 15% oxygen.

Additional Environmental Impacts: With SCR more fuel firing is required with a resulting increase in criteria pollutants and HAP emissions.

EPA needs to add and expand on another environmental impact associated with the use of SCR. Application of SCR as an exhaust gas treatment causes back pressure on the gas turbine (typically 2-4 inches water column). The result is less efficient turbine operations and thus more fuel firing to achieve the same turbine performance as without SCR. Besides the incremental capital cost to allow for increased firing rates, there are additional criteria pollutant and hazardous air pollutant (HAP) emissions, particularly formaldehyde. HAPs are not mentioned at all in the guidance and should be a factor in BACT determinations along with the increased C02, CO, and VOC emissions. EPA is planning on proposing a NESHAP standard for turbines in the next two months.

One additional issue with SCR is the release of ammonia. If there is unneutralized sulfuric acid aerosols in the ambient air and the area is ammonia limited, the ammonia reacts with sulfuric acid or nitric acid to form ammonium sulfate or ammonium nitrate, which results in additional fine particulate matter. Elevated concentrations of fine particulate matter can be a public health concern.

Technical/Data Corrections

1. In the August 4, 2000 background document (NOx Control on Combined Cycle Turbines--Issues Regarding the Use of Selective Catalytic Reduction in Attainment Areas for Dry Low NOx Natural Gas Combined Cycle Turbines) the comparison of combined cycle plant and coal plant NOx emissions on a "ppm" basis (Exhibit 1) is misleading. This is because coal plants (i.e., boilers) operate at about 3% oxygen, while combined cycle plants (i.e., turbines) operate at 15% oxygen. As a result, the turbine NOx concentrations would need to be multiplied by 3 to be on the same

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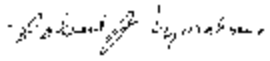
basis. It would be more appropriate to compare emissions on a mass basis, commonly referenced as lbs NOx per million Btu. This eliminates the air dilution impact. Currently, regulations with ppmv limits refer to a specific oxygen level (e.g., NSPS GG, 40 CFR 60.332).

2. Also in Exhibit 1, the tons of NOx emitted per year appears to be in error as the row "IF Class Natural Gas Combined Cycle Plant without SCR" should be close to "Coal Plant with SIP Call Level of Control." The fuel firing rate is needed to determine the exact tons/year number. EPA should review the calculations.

Thank you for the opportunity to comment on - the - Draft Guidance on BACT for NOx Control at Combined Cycle Turbines. If you have any questions, please contact me at 281-870-6524.

Sincerely,



Robert J. Morehouse

RJM/pfw

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Document 5

Western Resources

WAYNE KITCHEN
Vice President Regulatory Affairs

September 11, 2000

Ms. Pamela J. Smith Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
US Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Dear Ms. Smith:

Western Resources, Inc. (WR) appreciates the opportunity to provide comments on the recently published draft guidance on BACT decision-making for NOx control at combined cycle turbine installations. WR is a consumer service company with interests in monitored security and energy. Its electric utilities, KPL and KGE, operate eight generating stations for the purpose of providing reliable electric service to approximately 620,000 customers in Kansas. While WR's generating stations do not now include combined cycle turbine units, WR operates a number of simple cycle turbine generators and owns a share of a combined cycle turbine facility under construction. WR believes that BACT decisions for future combined cycle turbine generator installations have significance related to the long-term role and configuration of these systems.

In short, we encourage EPA to resist pressures to establish a one-size-fits-all guidance strategy for NOx BACT for combined cycle turbine generator facilities. We believe that the environmental impact of the mandatory addition of SCR or other end-of-pipe control systems to combustion turbines equipped with state-of-the-art dry low-NOx burners (DLN) will be negative not positive. We have briefly summarized our major concerns below:

1. Lack of Environmental Benefit:
The environmental benefit of NOx reductions from the incremental addition of SCR to combustion turbine systems equipped with 9 ppm-type DLN combustors is insignificant. A commonly-sized 75 MW combustion turbine operating at full load, 24 hours a day, 365 days a year, on natural gas will emit approximately 126 t--ns of NOx annually when equipped with 9 ppm-type combustors. This emission level would represent a 64% reduction (242 tons reduced) as a result of the DLN system. Actual emissions will be much lower as actual operating times will not approach the 24 hour, 365 day scenario. The addition of SCR to such units will provide an additional incremental reduction of approximately 68 tons (at 4.5 ppm). To put these emission levels in perspective, the 1996 federal National Emission Trends (NET) emissions inventory database for the State of Kansas estimates a total of 511,301 tons of NOx emitted in Kansas alone each year. These emissions originate from mobile sources (116.4%), electric utilities (20.0%), other point sources (21.6%), and area sources (41.9%). Any assertion that a 68 ton reduction from an annual inventory of greater than 511,000 tons will result in a meaningful environmental benefit simply is not realistic. Further, the emission points (stack heights) for these installations are not sufficiently elevated in most instances to promote long range transport, thus reducing transport concerns.

2. No Real Environmental Risks:
While the benefits of SCR add-ons to DLN combustor-equipped facilities are seemingly insignificant, the potential detriments are numerous. As recognized in EPA discussions of these considerations, a life-cycle analysis of NOx

emissions and NH3emissions from the manufacture, transport, and use of ammonia/urea liquids or gases may conclude that the detriments far out-weigh the benefits. These detriments include NOx emissions, NH3emissions, catalyst waste generation, station power losses, and ammonia handling safety. Further, the addition of SCR or other end-of-pipe control systems add both complexity and costs to a group of generating stations (e.g. combined-cycle combustion turbines) known for their extremely low emission levels. As a result, the reliability and dispatch priority may be diminished in favor of other higher-emitting units.

3. Regulatory Principles:
In addition to the environmental concerns associated with the inclusion of end-of-pipe controls to DLN combustor systems, several long-standing environmental principles are also tested by such an approach. First, the DLN combustor technology is a classical pollution prevention approach in that it controls emissions at their source. SCR and other end-of-pipe systems reduce emissions after generation. Under most state and federal environmental policies, these latter, after generation control systems are the least preferred emission control strategies. In order to promote pollution prevention at the source, it is sometimes necessary to accept a somewhat increased emission !cvel initially in order to achieve larger emission decreases over the long term.

Document 6

September 12, 2000

Pamela J. Smith
Information Transfer and Program Integration Division
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park
North Carolina 27711

Dear Ms. Smith:

Re: **Draft Guidance for NOx Controls in Power Plants**

This is a reply to the request for comments on the above Draft Guidance (65 Fed. Reg. 50,202) dated August 17. The *Environment and Regulatory Affairs (ERA) Committee* of *the ASME International Gas Turbine Institute* welcomes EPA's proposal to revise the BACT guidelines for gas turbine engines using Dry Low Emissions technology to prevent NOx emissions.

As background, the *ASME IGTI* organization has seventeen technical Committees which provide international forums for the exchange and development of information on the design and applications of gas turbines and related equipment. Many countries are now considering revisions to emission rules for these types of facilities. Our *ERA Committee* includes international industry and government members, which deal with environmental issues as they relate to emissions of air pollution and greenhouse gases.

As a generally clean source of energy, it is our view that efficient and clean-fueled gas turbine combined cycle, cogeneration and district energy plants are part of a solution for sustainable energy. The comments attached represent the views of several members of the Committee, and address both the SCR/NOx/ammonia issue, as well as the need for a modified approach to overall emissions permitting, plant efficiency and measurement. In addition to the comments, I have also enclosed background material from recent *IGTI* Newsletters, describing *IGTI* and addressing some of these issues.

We appreciate this opportunity to provide input into the EPA decision-making process. For any clarification, please do not hesitate to contact myself, or the Committee co-chair Leslie Witherspoon at 619-544-2434.

Sincerely,
/s/
Manfred Klein
Chair, *IGTI Environment and Regulatory Affairs Committee*
819-953-6630
manfred.klein@ec.gc.ca

Comments on EPA Draft Guidance for NOx Controls in Gas Turbine Power Plants

The *Environment and Regulatory Affairs Committee* of *the ASME International Gas Turbine Institute* welcomes EPA's proposal to revise BACT guidelines for gas turbine engines using Dry Low Emissions (DLE or DLN) technology to prevent NOx emissions. Our Committee generally agrees that 'ulta-low' NOx regulatory limits which require SCR units in addition to DLE are not usually an appropriate or cost-effective means to achieve reductions. This is based on the following;

1. Ammonia is a serious pollutant in itself, to both the public and to plant personnel. In addition, many processes like SCR can potentially produce other residual emissions, as well as N20, a strong greenhouse gas.

2. DLE is a prevention technology which is very cost effective in reducing emissions from the uncontrolled levels of 150-250 ppm, to reasonable levels of 9-25 ppm. There is in our view no significant difference to the environment between 90% reductions from 200 to 20 ppm, and 98% reductions from 200 to 5 ppm (especially if the latter causes an efficiency reduction or increased ammonia emissions).

3. Single digit (9 ppm) values may be applicable for very large utility-sized units (100-200 MW), but many smaller GT units in necessary cogeneration and district energy plants cannot physically and effectively meet these limits, and they operate much better and reliably in the 15 to 25 ppm range. Many industrial systems (pipelines) cannot practically and economically use SCR.

4. It is very difficult to measure and enforce single digit NOx emissions with existing methodologies that have undefined measurement variability. There is no allowance for the measurement uncertainty associated with the current level of "ultra low NOx " (less than 4 ppm) which could be as high as 50%. There are no allowances for variance in the ambient atmospheric conditions. To meet safely the limits at all operating conditions, the actual NOx should be around 1 ppm for a limit of 3 ppm. The Guarantees are not only in ppm but also in lb/hr. This requirement implies a methodology to calculate exhaust flow. For very large gas turbines, the error in measurement, using the suggested methodology, could be as high as 20%. While both EPA and California ARB are addressing this problem, the development of viable measurement protocols is only in the initial stages.
5. Efficient systems are important for energy conservation, preventing GHG and air toxic emissions, with cost-effective economics. Cogeneration plants with DLE systems are not highly polluting facilities, when compared to existing coal and oil burning stations. They also have only 25 to 40 percent of the CO2 emissions.

6. Combined cycle GT emission levels at 25 ppm represent a 0.6 lb/MWhr total criteria air contaminant level, whereas new modern coal/oil steam cycle plants have total (NOx + PM + SO2) levels in the 8 lb to 12 lb/MWhr range (existing average at ~20 lb/MWhr).

7. Efficient systems with clean fuels (Combined Heat and Power) should therefore be encouraged to address energy solutions and pollution prevention, and very aggressive NOx ppm limits on already clean systems tend to discourage these investments. The gas turbine and fuel cell sectors will be very important in future cleaner energy choices to achieve a number of international environmental goals

8. Energy facilities can be regarded as total systems, with the prime mover merely a major part of the larger system. Waste heat recovery credits (similar to previous NSPS Heat Rate Correction concept) should be considered, as steam turbines and heat exchange have almost no associated emissions. Output based standards, in lbs/MWhr of power and heat /cooling, can be an effective approach to encourage the best systems. We appreciate that EPA is now considering this latter methodology.

9. The US Department of Energy's Vision 21 program has some very attractive goals for 70% efficiency in power plants. Restrictions on NOx levels in the 5-10 ppm range will tend to compromise these important Climate Change objectives. Many modern gas turbines suffer mechanical and reliability problems associated with combustor oscillations due to aggressive DLE emission targets which adversely affect energy conversion.

10. BACT; The "lowest NOx ppm number" may not necessarily be environmentally the Best criteria, as it can restrict the cleanest, efficient technologies. It is very important that overall emission reduction strategies address all pollutants of concern in each application, as the risk of reducing some can easily be offset by increasing others. There are often tradeoffs, but some solutions will result in comprehensive benefits for most issues.

Document 7

September 12, 2000

Ms. Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planing and Standards
U.S. EPA
Research Triangle Park, NC 27711

Re: Draft Guidance on BACT for NOx Control at Combined Cycle Turbines

Dear Ms. Smith:

The Institute of Clean Air Companies, Inc. ("ICAC" or "the Institute") appreciates this opportunity to comment on *Notice of Availability of Draft Guidance on BACT for NO_x Control at Combined Cycle Turbines*, 65 Fed. Reg. 50202 (August 17, 2000) ("Draft Guidance"). ICAC is the national trade association of companies that supply air pollution control and monitoring technologies, including a range of technologies applicable to combined cycle gas turbines.

The draft guidance is ill-advised because it is based on inaccurate assumptions about NO_x and ammonia emissions from SCR-equipped gas turbines, and undercuts State efforts to address the most pervasive air pollution problem in the country by effectively raising the BACT NO_x emission limit to 9 ppm. The Draft Guidance would also remove a major incentive for development and use of lower-level control technologies, grant an effective monopoly to one manufacturer, and proceed on the basis of an unreasonable assessment of the tradeoffs between NO_x and ammonia.

In addition to the following explanation, we request a meeting with the appropriate EPA official and EPA contractor to discuss these comments further. An ICAC official will contact you shortly to arrange this meeting at your convenience.

I.

The clear lesson of BACT permitting is that due to local pressures and other reasons, States rarely go beyond U.S. EPA-approved BACT limits in permitting sources. Thus, the U.S. EPA's sanctioning of a 9 ppm NO_x limit as BACT for combined cycle gas turbines effectively raises the BACT limit to 9 ppm. Significantly, *SCR and other technologies are currently achieving NO_x emission rates of 2 ppm*, not 4-5 ppm as the Draft Guidance suggests. Thus the NO_x emission increase EPA proposes to sanction -- from 2 ppm to 9 ppm -- is nearly 500%!

At present, the most pervasive air quality problem in the country is nonattainment of the ozone standard. A principal precursor of ozone is NO_x. The industry most responsible for NO_x emissions is the power generation industry. And the most common power generation capacity being added (and thus subject to BACT) is gas turbines. Thus, the Draft Guidance frustrates in the worst way the ability of States to attain the ozone standard. The sense of the Draft Guidance is that this increase is not significant, when in fact it is extremely significant given the huge number of gas turbines being installed. We believe comments from State authorities will confirm this assertion. Increased NO_x emissions are particularly troublesome since their effects may be most manifest far downwind.

EPA says requiring SCR may increase NO_x emissions because it would raise the price of combined cycle gas turbines and thereby decrease the combined cycle capacity that is constructed and used for power generation. This, in turn, would lead to the use of less clean existing generation that could, on a national basis, result in greater overall NO_x emissions. But this reasoning fails since on a NO_x-per-unit-of-power basis, fewer turbines with only dry low NO_x technology can be installed before NO_x limits are exceeded; as a result, less power will be available before NO_x limits are exceeded. In addition, EPA's own background document *(NO_x Control on Combined Cycle Turbines*, August 4, 2000-Draft) shows only a 2.7% decrease in total combined cycle capacity using SCR (p. 7), and states also that "the analysis presented here may overstate the air quality benefit of not requiring SCR on combined cycle turbines" (p. 8). Clearly, 2.7% is within the IPM model's margin of error for looking at electricity generation over a large area. Every market forecast of which we are aware shows continuing growth in gas turbines. In fact, the Interstate Natural Gas Association of America says more than 250 GW of electric generation has been announced over the last three years, with nearly all of it gas-fired (Utility Business, August 2000, p. 52). The reasons for this growth are the inability of current coal-fired generating capacity to handle increased demand, and the cost and time of adding more coal-fired capacity to meet increased demand. We do not see the marginal cost of SCR making *any* difference.

Regarding disposal of catalyst, it is significant that catalyst suppliers offer recycling service with no or negligible economic impact to owners. Catalyst regeneration is also now offered, which reduces the catalyst life-cycle cost to owners.

We do not address EPA's analysis regarding the effects of ammonia emissions in general, but the Draft Guidance overstates the level of these emissions from SCR systems, thus leading to an inaccurate assessment of the purported NO_x-ammonia tradeoff. Vendors are guaranteeing ammonia slip from SCR-equipped gas turbines at less than 2 ppm. Since the ammonia slip increases as a catalyst ages, this means that over a significant part of the catalyst's life (currently about 8-10 years for gas turbines), ammonia emissions are far less than 2 ppm. Thus, the Draft Guidance overstates the effect of the ammonia by basing its analysis on the permitted ammonia level (e.g., 2 ppm), when in fact actual ammonia emissions are less until the very end of the catalyst's life. In addition, advanced SCR systems are under development that show promise in reducing ammonia slip to undetectable levels throughout the life of the system. As for ammonia handling, we note that 1) ammonia is probably the most commonly-handled chemical in the U.S., and safe-handling procedures are well-known; 2) ICAC is unaware of any releases of ammonia in SCRs that resulted in a workplace injury; and 3) technology is being demonstrated on a commercial-scale that allows urea to be converted to ammonia as-needed at the installation site.

II.

The 30-year history of technology development under the Clean Air Act shows that when clear, enforceable standards are set, the regulated community and technology vendors prove adept at finding cost-effective solutions. This is occurring with NO_x control technology on combined cycle gas turbines, as both NO_x and ammonia emissions are decreasing. But, conversely, experience under the Clean Air Act also shows that when there is no regulatory incentive, scarce research and development dollars are allocated elsewhere and such technology is not developed. Here, *EPA is removing the incentive to develop and deploy low cost technology that removes NO_x with little or no ammonia emissions*. This result is compounded because we are aware of only one company that currently supplies the approved dry low NO_x combustor technology. Although we express no opinion on the issue of dry low NO_x combustor performance, we note that EPA should point to sufficient operating history to satisfy itself that this technology alone can meet emission requirements under all operating conditions over the life of the turbine.

III.

Finally, the Draft Guidance is problematic even apart from the issue of emissions from gas turbines. By raising the emissions levels approved as BACT, and essentially defining BACT as requiring no controls, the Draft Guidance could constitute a potentially troublesome precedent for other technology-based determinations such as MACT and LAER, with adverse implications for reducing ambient concentrations of pollutants.

IV.

In conclusion, the Draft Guidance would hamper the States' ability to remedy the Nation's most pervasive air pollution problem even though, as Administrator Browner stressed last month in releasing EPA's *Air Quality Trends Report*, as a Nation we need to make more progress (not less) towards attainment of the ozone standard. Thus, EPA should rescind the Draft Guidance and allow NO_x control technologies to compete freely in the marketplace, and retain the ability of State and local authorities to reduce smog levels.

Once again, the Institute thanks the U.S. EPA for this opportunity to comment and requests a meeting with the appropriate EPA official and EPA contractor to discuss these comments further.

Respectfully submitted,
/s/
Jeffrey C. Smith

cc: John Seitz, U.S. EPA/OAQPS (MD-10)
Ellen Brown, U.S. EPA/OAPR (6103A)

Document 8

September 13, 2000

Ms. Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Subject: **Comments on Preliminary Draft –**
Guidance on BACT for Combined Cycle Turbines

Reliant Energy is providing written comment on the U.S. Environmental Protection Agency's (EPA) draft guidance on Best Available Control Technology (BACT) for combined-cycle combustion turbines that use dry low-NOx combustors. This guidance is particularly important as it contemplates the practice of requiring post-combustion NOx controls such as selective catalytic reduction (SCR) on these types of units in areas that are classified as attainment for ozone. Reliant Energy strongly supports EPA's assertion that, in the case of BACT determinations for combined-cycle units, permitting authorities should give careful consideration to the collateral impacts of SCR, specifically those associated with the use of ammonia as a reagent, and that the adverse impacts resulting from use of SCR may outweigh the benefits.

In the discussion contained in the draft guidance document, EPA correctly points out that there are significant collateral impacts that result from the use of SCR on combined-cycle generating units. Such impacts include the contribution to fine particulate formation, acidifying deposition and nitrogen deposition/eutrophication of nearby soil

and water that result directly from emissions of unreacted ammonia (slip) from units controlled with SCR. EPA also notes that other factors such as energy penalties, waste generation and safety issues associated with storage of large quantities of ammonia – a hazardous material – also should be considered when weighing the benefits of SCR for units that already emit NOx at less than 10 ppm.

These impacts are important factors that, in many cases, are routinely dismissed in the course of BACT determinations. In many cases, SCR is considered a nearly presumptive BACT standard for combined-cycle turbine generating units regardless of the status of air quality in the proposed location or the overall balance of environmental benefit. This draft guidance correctly supports the fact that, despite the additional NOx reductions that can be achieved through SCR, the trade-off of additional impacts often does not justify the requirement to add SCR and make additional marginal reductions in NOx emissions.

Reliant Energy appreciates your consideration of these comments on this important issue. Please contact me at 713-945-7167 if you have any questions or require additional information.

Sincerely,
/s/
Jason M. Goodwin, P.E.
Senior Engineer, Air Resources Division
Environmental Department
Wholesale Group

Document 9

September 14, 2000

VIA FEDERAL EXPRESS

Pamela J. Smith
Information Transfer and Program
Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Mutual Building
411 W. Chapel Hill Street
Durham, North Carolina 27701

Re: Draft Guidance on BACT for NOx Control at Combined Cycle Turbines

Dear Ms. Smith:

We are writing on behalf of the California Unions for Reliable Energy ("CURE") to comment on EPA's Draft Guidance on BACT for NOx Control at Combined Cycle Turbines ("Draft Guidance"). CURE is an association of labor unions whose members build, operate and maintain commercial, residential and industrial projects, including power plants. CURE's members live in and use the areas that suffer the impacts of environmentally detrimental projects, and are concerned that continued environmental degradation may jeopardize future jobs by making it more difficult and more expensive for business and industry to locate and expand in California and by making it less desirable for people to live here.

CURE has been a party to 20 power plant licensing reviews before the California Energy Commission since 1997. In this capacity, we have participated actively in all aspects of air quality permitting of combustion turbines in a combined cycle configuration. We have also repeatedly raised concerns regarding the use of ammonia, particularly anhydrous ammonia, at facilities proposing to control NOx emissions with Selective Catalytic Reduction ("SCR"). The concerns that we have identified include the risks associated with the handling and transportation of ammonia, as well as the secondary particulate formation associated with ammonia slip. Therefore, we are pleased that EPA is seeking to address these and other collateral environmental impacts associated with the use of ammonia with SCR.

However, we are dismayed with EPA's proposed solution to the problem. EPA's Draft Guidance suggests that where the environmental concerns associated with SCR outweigh the benefits, a permitting authority may allow higher NOx emissions than are typically allowed for combined cycle plants with only the use of dry-low NOx ("DLN") pollution control technology. This proposal does not comply with the Clean Air Act and fails to give adequate consideration to other pollution control technologies that can achieve greater NOx reductions than DLN without the use of ammonia. These other technologies, including SCONOx and XONON, are currently being proposed for use on combined cycle projects in California, are able to achieve similar or lower NOx emission levels than DLN alone or DLN and SCR, and do not cause the collateral environmental impacts associated with the use of SCR.

EPA should modify its Draft Guidance to clarify that where the environmental concerns associated with SCR outweigh the benefits, permitting authorities must first consider the use of these other, more effective NOx control technologies in a top-down BACT analysis before permitting the use of

DLN alone on combined cycle plants. Only if an applicant can demonstrate that alternative technologies are not BACT or LAER for a certain plant, should permitting authorities consider allowing plants to emit NOx levels greater than the maximum degree of reduction achievable.

I. EPA'S DRAFT GUIDANCE DOES NOT COMPLY WITH CLEAN AIR ACT BACT REQUIREMENTS

The Draft Guidance states that:

> a permitting authority could appropriately conclude that BACT in a specific case was DLN turbines without additional controls for a combined cycle gas turbine if a case-by-case assessment of the environmental, energy, and economic impacts demonstrates that the collateral environmental impacts associated with a control technology such as SCR outweighed the benefits of additional NOx reduction.[1]

This conclusion is not consistent with the Clean Air Act.[2]

The Clean Air Act defines BACT as:

> an emission limitation based on the *maximum degree of reduction* of each pollutant subject to regulation under [the Act] emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility ....[3]

The definition of BACT requires that collateral environmental impacts be taken into account in a permitting authority's BACT determination. However, it also requires that BACT be based on the "maximum degree of reduction" of regulated pollutants. The Draft Guidance recognizes that DLN without additional controls can only achieve an emission limitation of 9 part per million ("ppm") of NOx.[4] As explained below, 9 ppm NOx does *not* typically represent the maximum degree of reduction achievable from combined cycle plants, even when "energy, environmental, and economic impacts and other costs" are taken into account. Therefore, EPA should modify its Draft Guidance to ensure that other, more effective NOx control technologies are thoroughly considered by the permitting authority before allowing unnecessarily high NOx emissions from combined cycle power plants.

II. OTHER TECHNOLOGIES CAN MEET EMISSION LIMITS LOWER THAN 9 PPM NOx WITHOUT THE USE OF AMMONIA

At least two NOx control technologies are being proposed for combined cycle power plants in California to meet NOx levels of less than or equal to 2.5 ppm averaged over one hour without the use of ammonia. These technologies should be considered as superior options to DLN alone in any top-down BACT analysis for a combined cycle plant.

A. SCONOx

SCONOx is a pollution control technology designed by Goalline Environmental Technologies that uses a single catalyst to simultaneously remove NOx, CO, and VOCs from combustion processes.

SCONOx has several advantages over the use of DLN alone and DLN and SCR that make it highly desirable for use on combined cycle projects. First, regulatory agencies in California, including EPA Region IX, have concluded that SCONOx can achieve NOx emission levels of 2.0 ppm averaged over three hours or 2.5 ppm averaged over one hour. These emission levels are far superior to those achieved by DLN alone (9 ppm) and equivalent to those achieved by DLN and SCR. Second, SCONOx uses no ammonia, thus avoiding the collateral environmental impacts associated with the use of SCR. Third, SCONOx operates effectively at temperatures ranging from 300ºF to 700ºF, making it well suited for merchant power plant operation and providing better control during startups and shutdowns than achieved with other competing catalytic technology (e.g., SCR, CO oxidation catalyst). Fourth, unlike other catalytic systems, the SCONOx catalyst is continuously regenerated, assuring continuous maximum catalyst effectiveness.[5]

Despite these advantages, EPA's Draft Guidance makes only one passing mention of the SCONOx technology, stating that it "is currently considerably more expensive than SCR and it has not yet been used on large combined cycle natural gas turbines."[6] Neither of these assertions are sufficient reason to reject a technology as BACT.

First, the Clean Air Act does not allow EPA to reject a technology as BACT simply because it is "considerably more expensive" than another technology. Instead, the permitting authority must conduct a top-down BACT analysis in each case, putting the most effective control technology at the top of the analysis. The top-down process establishes this alternative as BACT unless the applicant demonstrates, and the permitting authority in its informed judgment agrees, that technical considerations, or energy, environmental, or economic impacts justify a conclusion that the most stringent technology is not "achievable" in that case.[7] "Cost effectiveness" is the economic criterion used in EPA's top-down BACT analysis to assess the potential for achieving a control objective at the lowest cost and is measured by dividing the total annualized costs of control by annual emission reductions.[8] That is not the analysis that EPA performed in its Draft Guidance. Moreover, considerable evidence indicates that, when all of the pollution control capabilities of SCONOx are considered (*i.e.*, its ability to control CO and VOCs, as well as NOx), SCONOx may be *less expensive* than SCR for a combined cycle plant. EPA should not prejudge the cost effectiveness of SCONOx in any particular case by determining *a priori* that SCONOx is "too expensive" to be BACT, as the Draft Guidance has done.

Second, EPA's comment in the Draft Guidance that SCONOx "has not yet been used on large combined cycle natural gas turbines" is irrelevant to the BACT analysis. A proper BACT analysis will implement the technology-forcing role intended by Congress by asking whether a technology is "technically feasible" for a project, not whether it has previously been used on an identical project. At least two EPA regional offices and one California air district have already determined that SCONOx is technically feasible for large combined cycle projects. Moreover, at least three large combined cycle plants in California have proposed to use SCONOx to achieve NOx emission levels equal to or better than the levels currently being permitted for SCR/DLN systems. Thus, even if scale-up concerns about the technology were valid (which they are not), it will soon be demonstrated for use on large combined cycle projects.

EPA Region I recently concluded, based on correspondence with ABB Alstom Power, that "it is our view that SCONOx is a technically feasible control option for large combined cycle turbine project" and "the Region now considers SCONOx a technically feasible and commercially available air pollution control technology that is expected to obtain emission levels for criteria pollutants such as NOx, CO and VOC comparable or superior to previously applied technologies for large combined cycle turbine applications." (Attachment 1.[9])

EPA Region IX has also determined that SCONOx is available and feasible for large combined cycle power plants since at least December 1999. (Attachments 2-5.[10]) In fact, as far back as 1998, EPA

Region IX and the South Coast Air Quality Management District ("SCAQMD") based respective BACT and LAER determinations for NOx for combined cycle power plants in California on the performance of SCONOx. The determinations of 2.0 ppm NOx averaged over three hours or 2.5 ppm NOx averaged over 1 hour were based on the 32-MW Federal Cogeneration Facility ("Federal Facility") in Vernon, California, which uses SCONOx. (Attachment 6;[11] Attachment 7.[12]) An equivalent emission limit for NOx has been adopted as BACT and LAER for all large gas turbines permitted in California since, based on EPA's and the SCAQMD's determinations for the Federal Facility (*e.g.*, Sutter Power Project, High Desert Power Project, La Paloma Generating Project, Los Medanos Energy Center, Delta Energy Center).

In addition, both EPA and other regulatory agencies that have considered scale-up of SCONOx to larger size turbines have concluded that scale-up is not a concern. EPA Region IX concluded there are no scale-up issues associated with SCONOx in 1998. "In June 1998, Region 9 informed the South Coast Air Quality Management District (AQMD) that we were not aware of any technical problems associated with scale-up of the SCONOx technology to larger turbines." (Attachment 5: Enclosure 1, p. 2.) The SCAQMD rigorously evaluated the scale-up issue in its BACT/LAER determination and concluded that:

> It is the staff's technical finding that the SCONOx control technology can be scaled up in comparison to the 32 MW demonstration plant since the exhaust characteristics of the turbines are similar. Based on staff review of AQMD source test reports for different turbines, staff finds that the NOx reduction process and the characteristics of the exhaust gases from natural gas fired turbines are similar regardless of size above 3 MW. Therefore, the identified emission rate of 2.5 ppm NOx at 1-hour average constitute BACT/LAER for gas turbines with rated capacities of 3 MW or larger. U.S. EPA staff also has the same technical judgment concerning this issue. (Attachment 7, p. 4.)

This position is echoed throughout the documentation supporting the SCAQMD's BACT/LAER determination that is currently used throughout California, including statements that: "[t]here is no known technical limitation that would render the exhaust flue gas of a large industrial turbine to have different characteristics than exhaust from a 30 MW aeroderivative turbines" (*id.*, p. 3-4); and "[s]ince there is no known technical reason that will render the exhaust flue gas from a large gas-fired turbine to have different characteristics than exhaust from a 30 MW turbine, AQMD staff has concluded that LAER, as presented in the Staff Report, must apply to gas turbines over 3 MW size" (*id.*, p. 3-8).

Since EPA Region IX and the SCAQMD made their BACT and LAER determinations, SCONOx has been proposed for use on at least three large combined cycle plants in California, and permitted for use on one. The La Paloma Generating Company proposed to use SCONOx on one of the four 172 MW combustion turbines on its 1,048 MW combined cycle power plant in western Kern County. The San Joaquin Valley Unified Air Pollution Control District, EPA Region IX, and the California Energy Commission all permitted this use.

Similarly, the Otay Mesa Generating Company has proposed to use SCONOx on both of the combustion turbines (in combined cycle mode) on its 510 MW power plant in San Diego. Otay Mesa proposes to meet a NOx limit of 2 ppm averaged over three hours with a target of 1 ppm. Otay Mesa also proposes an annual NOx emission limit of 100 tons per year. All of these limits are less than or equal to the NOx limits being permitted for combined cycle projects using DLN and SCR in California. The San Diego Air Pollution Control District has issued a proposed air permit incorporating these NOx limits for Otay Mesa. A final permit requiring the use of SCONOx is expected soon.

Finally, EM-One Power Station has proposed to achieve emission limits of 1 ppm NOx and 0.5 ppm CO with the use of SCONOx on the Nueva Azalea plant in Los Angeles County. ABB Alstom Power

has provided a guarantee for these emission limits. This plant is currently being permitted by the SCAQMD.

For all these reasons, EPA should modify its Draft Guidance to ensure that permitting authorities do not preclude the consideration of SCONOx, or other zero ammonia technologies that may develop in the future, in their BACT analyses for combined cycle plants. Indeed, EPA should encourage the use of zero ammonia technologies that fulfill its mandate for reducing the emissions of regulated pollutants to the maximum extent possible.

B. **XONON**

XONON is another pollution control technology for combined cycle power plants that can reduce NOx emissions to 2.5 ppm over a one-hour average without the use of ammonia. XONON is currently operating successfully on smaller engines under combustor conditions representative of large turbines. In addition, XONON has been proposed for use on the Pastoria Energy Facility in California, a 750 MW combined cycle plant. The San Joaquin Valley Unified Air Pollution Control District has issued a final permit to Pastoria allowing the use of XONON.

XONON is a combustion system that improves the combustion process within a turbine by lowering the peak combustion temperature, thereby preventing the formation of NOx. It works by combusting a portion of the fuel in a flameless reaction within the catalyst. This process eliminates the need for peak flame temperatures at level that forms NOx. It also lowers emissions of CO and hydrocarbons, and does not require the use of ammonia.

EPA's Draft Guidance fails to mention the use of XONON as an alternative to SCR. Instead, it focuses on DLN alone as the sole, viable pollution control technology alternative to the use of SCR on combined cycle projects. EPA should modify the Draft Guidance to ensure that permitting authorities do not fail to examine the use of SCONOx, XONON, and other NOx pollution control technologies as alternatives to the use of SCR.

III. **CONCLUSION**

At least two technologies exist that can achieve lower NOx emission levels than DLN on combined cycle power plants without the collateral environmental impacts associated with the use of ammonia. These technologies are viable alternatives to the use of SCR that should be examined in any top-down BACT analysis for a combined cycle plant. EPA's Draft Guidance threatens to preclude the consideration of these technologies by permitting authorities who are concerned about the collateral environmental impacts of ammonia use associated with SCR. EPA's Draft Guidance also favors and encourages increasing NOx emission limits, in direct opposition to the requirements of the Clean Air Act. EPA should modify the Draft Guidance to make clear that it does not intend to preclude the consideration of these technologies in any given case.

Please call us with any questions about these comments.

Sincerely,
/s/
Katherine S. Poole

Attachments
Draft Guidance, p. 4.

[1] 42 U.S.C. §§ 7401 *et seq.*

[2] 42 U.S.C. § 7479(3) (emphasis added).

[3] Draft Guidance, p. 2.

[4] The SCONOx catalyst works by simultaneously oxidizing CO to CO_2, hydrocarbons to CO_2 + H_2O, NO to NO_2, and then absorbing NO_2 onto its surface through the use of an absorber coating, such as potassium carbonate (oxidation/absorption cycle). The regeneration of the SCONOx catalyst, one of the features that makes the system so unique, is accomplished by passing a dilute hydrogen reducing gas across the surface of the catalyst in the absence of oxygen. The reductant in this gas reacts with nitrites and nitrates to form water and elemental nitrogen. Carbon dioxide in the regeneration gas reacts with potassium salts to form potassium carbonate, which is the absorber coating that was on the surface of the catalyst before the oxidation/absorption cycle began.

[5] Draft Guidance, p. 3.

[6] U.S. EPA, New Source Review Workshop Manual. Prevention of Significant Deterioration and Nonattainment Area Permitting, Draft, p. B.2 (Oct., 1990) ("NSR Manual.")

[7] NSR Manual, p. B.36.

[8] Letter from John P. DeVillars, Regional Administrator, Region 1, U.S. EPA, to Robert Varney, Commissioner, Department of Environmental Services, New Hampshire, Subject: Recent SCONOx Pollution Prevention Control System Development (December 20, 1999) (Attachment 1).

[9] Letter from Matt Haber, EPA Region IX, to Michael Kussow, Shasta County Air Quality Management District (Feb. 4, 2000) (Att. 2); Letter from Matt Haber, EPA Region IX, to Dennis J. Champion, Elk Hills Power, LLC (Feb. 10, 2000) (Att. 3); Letter from Matt Haber, EPA Region IX, to all Air Pollution Control Officers in California (April 4, 2000) (Att. 4); Letter from Matt Haber, EPA Region IX, to Ellen Garvey, BAAQMD (May 31, 2000) (Att. 5).

[10] Letter from Matt Haber, Chief, Permits Office, U.S. EPA, to Robert Danziger, President, Goal Line Environmental Technologies (March 23, 1998) (Attachment 6).

[11] SCAQMD, Staff Report for Best Available Control Technology Guidelines Update (Phase IID), June 12, 1998 (Attachment 7)

Document 10

September 15, 2000

Ms. Pamela J. Smith
Information Transfer and Program Integration Division
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park
North Carolina 27711

Re: Draft Guidance Document on Consideration of Collateral Environmental Impacts Associated with Dry Low NO_x Combined Cycle Natural Gas Turbines

Dear Ms. Smith:

Thank you for the opportunity to provide comment.

There are two primary issues that Solar Turbines Inc. (Solar) would like to bring to the attention of EPA with respect to the Draft Guidance Document on Consideration of Collateral Environmental Impacts Associated with Dry Low NO_x Combined Cycle Natural Gas Turbines. Solar's comments are geared toward issues as they affect turbines in Solar's size range (1-13 MW).

- Use of the term "DLN"
- Assumption of large, utility size "combined cycle natural gas plants"

Solar has several other issues with the draft guidance. These issues are adequately addressed in the comment letter from the IGTI Environment and Regulatory Affairs Committee letter, authored by Manfred Klein, and will not be reiterated in this letter.

Solar agrees that low single digit NO_x regulatory limits, which require Selective Catalytic Reduction (SCR), are usually not appropriate or cost-effective means to achieve additional NO_x reduction. Solar also feels that the cost of the other NO_x add-on control technology, SCONOx, is not appropriate or cost-effective means to achieve additional NO_x reduction. The costs of adding add-on control to a mid range gas turbine with a DLN combustion system outweigh the perceived benefits in air quality. Add-on control systems reduce the efficiency of the system, increase operational complexity, and reduce the reliability of the equipment.

USE OF THE TERM DLN

Solar feels that the draft guidance mis-uses the term DLN (Dry-Low-NOx). The draft guidance document uses the term DLN as if it is a new innovative technology that by definition equates to single digit NO_x emissions. The draft guidance says, "… Dry low NOx (DLN) turbines, a technology that was developed to achieve single digit NOx emissions without add-on controls (emphasis added), can be operated so that they emit no more than 9 ppm of NOx…" The statement may be true of one

manufacturer's product but it is not representative of all gas turbine manufacturers nor to all sizes and designs of gas turbines.

Gas turbine manufacturers call their dry-low-NOx combustion systems various names including DLN, DLE (Dry Low Emissions), SoLoNOx] (Solar's trade name), etc. All names represent dry lean combustion/lean pre-mix combustion systems. Lean combustion technology development can be traced back to ~ 1975. It was in the early 1990's that dry-low-NOx systems became more prevalent.

In 1987, Solar began a major development effort to integrate dry-low-NOx combustion technology into its product lines. In 1992, Solar introduced the first industrial gas turbines employing a lean-premixed combustion systems for emission control. The lean-premixed turbines were originally introduced at 42 ppm NO_x and are now sold at 25 ppm NO_x on natural gas. Other gas turbines manufacturers have followed suit, and, at this time, nearly every manufacturer has introduced a low emissions gas turbine product line based on lean-premixed combustion. Most manufacturers currently offer their DLN products at 25 ppm NO_x.

There are many design and performance differences between large utility size gas turbines and smaller industrial gas turbines that necessitate different regulatory interpretations and requirements. The statements in the draft guidance seem to assume that a 5 MW gas turbine is similar in design and emission characteristics to a 225 MW turbine. This assumption is not valid.

Turbines <25 MW generally have annual combustors or can-annular combustors. The other type of combustor, silo (frame-type) is typically larger than annular or can-annular combustors and is used for larger scale applications. The different combustor designs affect NO_x emission characteristics and likewise the theoretically achievable NO_x emission level. Large gas turbines are capable of lower NO_x emissions than smaller gas turbines even though both may utilize DLN combustion technology. Gas turbine manufacturers continually strive to achieve lower NO_x emissions while maintaining the reliability, availability, maintainability, and durability of the gas turbine.

Solar recommends that EPA not define DLN as "a technology that was developed to achieve single digit NOx emissions without add-on controls" as the definition is not accurate and misleading.

ASSUMPTION OF UTILITY SIZE "COMBINED CYCLE NATURAL GAS PLANTS"

It seems that the language used in the draft guidance is meant to apply to **large, utility** combined cycle natural gas plants although the assumed size of plant is not stated. Mid range gas turbines can also be utilized in combined cycle applications. Although technically feasible, combined cycle projects are rarely economically feasible on gas turbines less than 50 MW is size.

The draft guidance states, "… In most instances, BACT control at combined cycle natural gas turbines plants is found to be SCR…" This statement is valid for large, utility combined cycle natural gas plants but not for smaller gas turbines where BACT is usually 25 ppm NO_x. For mid-range gas turbines the BACT process eliminates SCR and other NO_x control technologies on the basis of cost.

Solar is concerned with the misapplication of emission capabilities across a wide range of units. It is not uncommon for guidance/regulations and likewise regulatory agency staff to assume that all gas turbines of

any size are the same, i.e., can achieve the same emission levels. Solar spends significant time with our customers in the permitting process differentiating mid-range turbines from large utility-size turbines.

Solar recommends that EPA add a statement to the guidance that addresses the size class of turbine or size of combined cycle plant on which the guidance is based.

Solar asks that EPA consider the aforementioned issues as well as those presented by the IGTI committee prior to finalizing the guidance. Thank you again for the opportunity to provide comment. Please feel free to contact me at 619.544.2434 if you have any questions or need any additional information.

Sincerely,
Solar Turbines Incorporated
/s/
Leslie Witherspoon
Manager, Environmental Programs
D:\LE

Document 11

New York State Department of Environmental Conservation
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John P. Cahill
Commissioner

SEP 15 2000

Ms. Pamela J. Smith
Information Transfer and Program Integration Division (MD- 12)
Office of Air Quality Planning and Standards
USEPA (e-mail smith. pam@epa. gov Research Triangle Park, NC 27711

Draft Guidance on BACT for NOx Control at Combined Cycle Turbines

Dear Ms. Smith:

Enclosed please find comments from the State of New York on the draft Guidance on BACT for NQ, Control at Combined Cycle Turbines.

New York has three major comments on the, guidance:

1. The advancement of the state-of-the-art would be undermined. SCONOX and XONON may result in much lower emissions than dry-low-NO, Systems, but would possibly not need to be considered under this guidance

2. The guidance does not adequately consider downwind impacts from the higher emissions with dry-low-NOx

3. Oil emissions from this type of Project arc not considered. Historically, dry-lo w-NOx has not effectively worked on oil firing. Whfle oil firing is limited for these facilities, it does account for a sigruificant portion of the potential to emit.

The guidance does offer a useful approach to take when considering other impacts beyond cost when determining BACT, however, in this instance the emission differences are too great.

Thank you for the opportunity to comment. If you have any questions, please contact Mr. Randy Orr of the Division of Air Resources' Bureau of Stationary Sources at (518) 457-7688 or email him at E-Mail www.dec.state.ny.us.

Sincerely,

/s/

Robert K. Warland, P. E.
Director, Division of Air Resources

Enclosure

cc: Ms. O'Sullivan STAPPA/ALAPCO (email add: gosulliv@sso.org)
Dr. Amar NESCAUM (email add: pamar@nescaum.org)

NOx Control in Gas Turbines

Comments on the draft 08/04/00 memo from John Seitz

1. Background on No. Control: Recent permits have been issued at 2 ppmvd for NO. in Connecticut, Massachusetts and New York. California has determined 2.5 ppmvd to be their presumptive BACT (essentially LAER). The Massachusetts permits have the facilities at 2 ppmvd NO., and 2 ppmvd ammonia slip.

2. Ammonia Safety, The, discussion on ammonia safety does not support the conclusion.

3. Waste Issues: The discussion on waste issues does not support the conclusion.

Comments on the draft 08/04/00 NOx Control on Combined Cycle Turbine Issue Paper supporting the Seitz memo.

1. Background: Exhibit 1: The tonnage emission estimates for combustion turbines may be slightly low. They should be on the order of 480, 170 and 40 (at 2.0 ppmvd) instead of 420, 150 and 60. This assumes a cycle efficiency of 48% instead of 52%.

2. Background: Exhibit 1: The exhibit should state the 02 percentage in the units for concentration.

3. Background: Exhibit 1. The exhibit should state the energy efficiencies (mxriBtu/MW) and lb/mmBtu emission rates for each plant type.

4. Background: para 4, SCONOX has been proposed on a large turbine in California. The project is in the review stage.

5. Background on Displacement and Effects on NOx Emissions: Exhibit 2: The difference in Total NO, emissions is negligible and totally within the margin of error considering the number of variablez and the time into the future.

6. Background on Displacement and Effects on NOx Emissions: para. 9: The study referenced discussed very large sources of NOx and local ozone formation (ten hour reaction times). That study fails to 'investigate long range impacts of NOx emissions. Attainment NSR should consider downwind impacts as part of the environmental review.

7. Background on Displacement nod Effects on NOx Emissions. para. 9: The emission levels being considered (9 ppmvd and much lower) can safely be considered to be "smaller sources" of NOx and the rate of ozone formation would be comparable. Therefore, higher tUnibbiuns being proposed in the Issue paper would lead to more ozone formation.

Document 12

HUNTON& WILLIAMS

September 18, 2000 FILE NO: 31531.020001

BY FAX

Pamela J. Smith
Information Transfer and Program
Integration Division (MD-12)
Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park North Carolina 27711

Re: Comments on Draft Guidance for NOx Control at Combined Cycle Units

Dear Ms. Smith:

These comments are filed on behalf of the Utility Air Regulatory Group (UARG) in response to EPA's request for comments in 65 Fed. Reg. 50202 (August 17, 2000) concerning the Agency's draft best available control technology (BACT) guidance for NOx Control at Combined Cycle Units. UARG is a voluntary, nonprofit, ad hoc group of over 55 electric utilities, the Edison Electric Institute, the National Rural Electric Cooperative Association and the American Public Power Association (Enclosure 1). UARG participates on behalf of its members collectively in federal Clean Air Act rulemakings, guidance, and related litigation concerning issues of general interest to the electric utility industry.

In general, UARG supports EPA's draft guidance. We believe that several related policy issues should be clarified, and provide additional information and support in the attached technical paper by J.E. Cichanowicz (Enclosure 2). We believe that state permit writers should have a great deal of flexibility in determining BACT. The Clean Air Act as well as EPA's regulations make it abundantly clear that a BACT determination must be based upon a case-by-case, site-specific balancing of energy, environmental, and economic impacts and other costs, and mandate that this balancing be done by the appropriate State permitting authority.

I. The Clean Air Act

In the 1977 Amendments to the Act, Congress enacted a program for the prevention of significant deterioration of air quality. The Act's general scheme requires EPA to adopt nationally applicable air quality standards and other regulations which the States have "the primary responsibility" to implement. 42 U.S.C. §§7401(a)(3), 7407(a); see

also 42 U.S.C. § 7410. In keeping with this scheme, Congress instructed EPA to develop and promulgate nationally applicable PSD regulations defining the requirements that a State must meet if that State chooses to adopt and get EPA approval of a PSD program. 42 U.S.C. §§7410(a)(2)(D), 7471. Congress intended these "measures" to allow States to play a major role in devising the PSD requirements that would work best within their boundaries. *See*, e.g., A Legislative History of the Clean Air Act Amendments of 1977 (hereinafter "1977 Legis. Hist.") at 531-33.

Among the PSD requirements that Congress imposed was that the State require any proposed major emitting facility subject to the PSD program to apply BACT for each pollutant subject to regulation under the Act that the source emits in a significant amount. 42 U.S.C. §7475(a)(4). The Act mandates that BACT limits are to be determined on a case-by-case basis after taking into account energy, environmental, and economic impacts and other costs. 42 U.S.C. §7479(3).[1] As Congress explained, in making this "key decision . . . the State is to take into account energy, environmental, and economic impacts and other costs of the application of best available control technology. The weight assigned to such factors is to be determined by the State." 1977 Legis. Hist. at 1405 (emphasis added).[2] In other words, under the Act, the State can assign whatever weight to these "consideration" factors that the State deems appropriate. Thus, the BACT standard envisaged by Congress is consistent with the general intent of the Act that the States have primary responsibility to determine the content of emission limitations needed to meet "minimal" federal requirements.

Nowhere in the Act is there any suggestion that certain of the BACT criteria – energy, environmental and economic impacts and other costs – should be emphasized over others. Nowhere in the Act is there any indication that BACT limits must be the lowest emission limits that are technically and economically feasible for a similar source or source category.[3] And, nowhere in the Act is there any presumption that some technology is BACT simply because it has been determined to be BACT for a given type of emission source in another location. Congress recognized that the balancing test is mandatory simply because site- specific considerations will warrant emphasis on different considerations.[4]

Federal courts have consistently endorsed the statutory requirement that BACT be determined through a flexible, balancing process. The United States Court of Appeals for the District of Columbia Circuit pointed out, for example, that "BACT is defined, in general, as a level of control technology appropriate to the facts and circumstances of the particular applicant." *Alabama Power v. Costle*, 606 F.2d 1068, 1085 (D.C. Cir. 1979) (emphasis added). The United States Court of Appeals for the Ninth Circuit observed that "the BACT determination is . . . source specific."

Northern Plains Resource Council v. EPA, 645 F.2d 1349, 1359 (9th Cir. 1981) (emphasis added). Thus, the court concluded while a particular control technology may be BACT for one plant, the permitting authority "might decide that for [another] . . . facility . . . [that technology is] inappropriate for economic *or* energy *or* environmental reasons." *Id*. (emphasis added).

Court decisions, therefore, confirm what the language of the Act makes plain: a BACT determination must be made on a case-by-case basis by the State after taking into account energy, environmental, and economic impacts and other costs. Uniformity is not mandated by the BACT provisions; flexibility is.

II. EPA's PSD Regulations and Guidance

EPA promulgated a regulatory BACT definition in 1978 that, in all respects relevant here, is identical to the statutory definition. 43 Fed. Reg. 26,388, 26,404 (June 19, 1978).[5] The regulatory definition of BACT, like the statute, establishes that the BACT analysis must include a balancing of the relevant statutory factors. And, like the Act, the regulations limit consideration of technology to control technologies that are deemed "available" to that specific source. Indeed the regulations make it abundantly clear that the statutory criteria, including economic costs and energy, must be answered before a technology used in other types of sources can be transferred to the new source. *See* 43 Fed. Reg. 26,380, 26,397 (1978).

Shortly after promulgating its PSD regulations, EPA released Guidelines for Determining Best Available Control Technology which explained that a BACT determination is based upon the standard of flexibility. EPA, OAQPS, Guidelines for Determining Best Available Control Technology (Dec. 1978). Specifically, the permitting authority (in this case, the States) must

> consider a number of local factors (for example the size of the plant, the amount of air quality increment that would be consumed, and desired economic growth in the area) in deciding on a weighting scheme. *State judgment . . . [is one of] the foundations for the BACT determination.*

Id. at 4 (emphasis added). Among the type of "economic impacts" that should be assessed, according to the 1978 Guidelines, are the cost per unit of pollution removed (for example, dollars/ton) and cost versus additional portion of remaining PSD increment preserved for future growth. *Id*. at 14.

EPA's view of the BACT standard was reinforced in its 1980 PSD Workshop Manual wherein EPA recognized that

the reviewer's primary responsibility is to determine the best emissions strategy to balance the environmental benefits gained from applying pollution control technology with the prudent use of energy and justifiable industrial expenditures. EPA, PSD Workshop Manual at II-B-2 (Oct. 1980).

In the mid-1980s, EPA's then-Assistant Administrator for Air and Radiation, J. Craig Potter, became concerned that PSD applicants were not adequately analyzing the full range of alternative control strategies in BACT review." Potter, J. Craig, Memorandum on Improving New Source Review (NSR) Implementation, to all Regional Administrators at 3 (Dec. 1, 1987). To ensure that alternative control strategy analyses were comprehensive, Mr. Potter directed his staff to develop guidance on the use of a "top-down" approach to BACT which required the PSD permit applicant and the permitting agency to evaluate all technologies that were more stringent than the NSPS to determine BACT. The Potter memorandum caused considerable confusion in the regulated community because some permitting agencies (including some EPA Regions) read the memorandum to establish a BACT determination process fundamentally different than the process established by EPA in its PSD rules, in its earlier guidance, and even potentially at odds with the criteria embodied in the statutory BACT definition. To settle a legal challenge to the Potter memorandum, EPA agreed to propose and make available for comment any change to the PSD regulation if it wished to make the top-down approach, in the inflexible manner in which some agencies had interpreted it, mandatory.

In July 1996, EPA issued a proposal to revise the PSD rules. 61 Fed. Reg. 38,250 (1996). In the proposal, EPA explained that the Act establishes two core criteria to be satisfied in making a BACT determination. First, all available control systems for the source, including the most stringent, must be considered. Second, the selection of a particular control system as BACT must be justified in terms of the statutory criteria – energy, environmental and economic impacts and other costs – and be supported by the record, and include an explanation for the rejection of any more stringent control systems. *Id.* at 38,272. Notably, EPA's proposed revisions to the BACT regulations recognize and endorse the statutory case-by-case approach to making BACT determinations by State permitting authorities.

III. EPA's Proposed BACT Guidance

We endorse EPA's guidance because it assures state permit writers that they have the authority to implement the statutory and regulatory criteria – energy, environmental and economic impacts and other costs – in making BACT determinations. Moreover, state permit writers are free to determine the weights that are to be assigned to these factors. While evident from the Act and EPA's implementing regulations, the guidance should clarify that state

permit writers have authority to consider the incremental costs and benefits of requiring selective catalytic reduction technology to further reduce NOx emissions. We agree with EPA that those "energy, environmental and economic impacts and other costs" include the effect of ammonia slip on the formation of fine particles and visibility, the effect of acidifying deposition on soils and water bodies, the possibility of nitrogen deposition causing eutrophication of water bodies, public concerns over ammonia handling safety, and the costs and environmental problems associated with the disposal of spent catalyst materials. EPA's § 112(r) Accidental Release Program requirements (especially the worst-case scenario analysis) have exaggerated the risks of ammonia handling, which has led to community fear and outrage over the storage of ammonia used for new SCR systems. Permit writers tend not to be strong proponents of ammonia when confronted by angry local politicians and citizens. While we agree that ammonia can be handled safely with precautions, EPA has made it a significant issue that should be considered when evaluating the emission benefits of SCR over low NOx combustors alone.

We also believe that the statutory and regulatory criteria allow state permit writers to consider other relevant factors that EPA did not discuss in its draft document, such as efficiency penalties and limitations in measurement techniques. Recent studies and analysis have drawn into question the ability of current technology to accurately measure NOx on a consistent basis at the very low concentrations associated with application of SCR. One such limitation is the absence of an EPA reference method designed for such low NOx levels. Although EPA is currently working, in conjunction with the Electric Power Research Institute and others, to study and address such issues, that work is in the early stages. In the meantime, data suggests that monitor variability (and other limitations of current measurement techniques) could result in unavoidable excursions above low NOx limits. Sources attempting to compensate for such variability, and minimize such excursions, are forced to apply an even greater level of control, which results in additional impacts such as increased ammonia slip. Thus permit writers should be free to evaluate the benefits of a permit limit below 5 ppm using SCR in comparison with a permit limit of 9 ppm limit in light of the uncertainty of NOx measurements at such low levels.

Many of these issues are discussed and, to the extent practicable, quantified in the Cichanowicz report. For example, a state permit writer is authorized to conclude in a case-by-case analysis that BACT for a dry low NOx combustor would not require SCR where the SCR would provide an incremental reduction of 159 tons of NOx while releasing 100 tons of ammonia into the atmosphere and producing an addition 500 tons of CO2. The state permit writer is entitled to weight the statutory factors in a manner that is appropriate for the particular case that is being analyzed.

The draft guidance should clarify that there is nothing "magic" in the Act or EPA's regulations about a 9 ppm

emission rate at a dry low NOx combustor. For example, many combined cycle units include supplemental firing (e.g., duct burners) that will have a slightly higher – perhaps 10-12 ppm – emission rate.[6] There is no reason that this analysis would not apply to such units, and the guidance should clarify this point. Moreover, the guidance should clarify that the same analysis would apply to single cycle combustion turbines[7] or to combustors with NOx rates higher than 9 ppm. The results of any analysis must be case-by-case, and neither the Clean Air Act nor EPA's rules allow EPA to dictate in the abstract the results of such an analysis.

* * * * *

UARG appreciates the opportunity to comment on EPA's draft guidance. If you have further questions please call Craig S. Harrison (202-778-2240).

Sincerely,
/s/
F. William Brownell
Craig S. Harrison

Enclosures

[1] The only constraint Congress placed on the balancing test is that the final decision not yield an emission limit less stringent than any applicable new source performance standard. Id.

[2] See also 1977 Legis. Hist. at 729 (emphasis added) ("One objection which has been raised to requiring the use of the best available control technology is that a technology demonstrated to be applicable in one area of the country is not applicable at a new facility in another area because of difference[s] in feedstock material, plant configuration or other reasons. For this and other reasons, *the committee voted to permit emission limits based on best available technology on a case-by-case judgment at the State level*.").

[3] Indeed, such an interpretation of the Act would essentially make BACT limits equivalent to "lowest achievable emission rate" limits which Congress has imposed only on sources locating in nonattainment areas. See 42 U.S.C. §7501(3).

[4] 1977 Legis. Hist. at 729.

[5] In response to a legal challenge EPA amended its PSD regulations in 1980. 45 Fed. Reg. 52,676 (1980). The current definition of BACT, like the one promulgated in 1978, closely tracks the statutory definition found in 42 U.S.C. §7479(3). See 40 C.F.R. §§52.21(b)(12).

[6] EPA's regulatory structure has created a great deal of confusion concerning NOx emissions at combined cycle units that have duct burners as well as turbines. At UARG's request, EPA's final new source performance standards for subparts Da and Db agreed that when subpart GG (combustion turbines) is revised, the Agency will regulate combined cycle units under a single rule. *See* 63 Fed. Reg. 49,449, col. 1. The BACT analysis for these units is similarly confused.

[7] In addition, there have been a variety of technical problems in making SCR function properly at simple cycle turbines. *See* Cichanowicz and Angelo, Summary of Recent Experience with SCR NOx Control on Simple Cycle Combustion Turbines (April 1999) (Enclosure 3) which we previously provided to OAQPS

Enclosures

Document 13

Enron Corp.
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(723) 853-6161

September 18, 2000

Pamela J. Smith
Information and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, North Carolina 27711

Re: EPA Guidance Document on BACT for Combined Cycle Turbines

Dear Ms. Smith:

In response to the request for comments in the August 16, 2000 Federal Register regarding the Environmental Protection Agency's (EPA) guidance document regarding Best Available Control Technology (BACT) for combined cycle turbines, Enron wishes to provide the comments below for consideration.

Enron is one of the world's leading electricity, natural gas and communications companies. The company, which owns approximately $46 billion in energy and communications assets, produces electricity and natural gas, develops, constructs and operates energy facilities worldwide, delivers physical commodities and financial and risk management services to customers around the world, and is developing an intelligent network platform to facilitate online business.

Enron agrees with EPA that collateral environmental impacts should be considered when determining BACT for combined cycle turbines, and as a result of this consideration dry low NO,, (DLN) turbine controls could be the technology of choice over selective catalytic reduction (SCR) in many cases in ozone attainment areas.

Agencies often only consider SCR when determining BACT for limiting NO., emissions on natural gas combined cycle turbines in ozone attainment areas. Enron believes that a full life cycle analysis of the catalyst would reveal that SCR is not the technology of choice in some instances in attainment areas. Even though SCR, when used with DLN turbines would limit Nox emissions to below the level of a DLN turbine alone, it may be environitientally preferable to operate these turbines without SCR.

Because of the added capital and operating costs of installing and operating SCP, fewer combined cycle electricity generating plants may be constructed and as a result more electricity will be produced by older coal-fired plants with greater NO. emissions and therefore total NO,, emissions would increase, not decrease. As with other competitive industries, changes in capital and operating costs associated with requirements for pollution control devices can have an effect on decisions about whether new plants will be built in the electricity generating industry.

Further EPA should consider that the ammonia that is reqtLired for SCR to operate has its own set of environmental problems that outweigh any benefit of the small increment of NO,, reduction that is achieved by putting SCR on

turbines. Also, the DLN turbine is a pollution prevention technology that limits NO,,, formation unlike SCR, which is designed to control NO.,, that has been formed. Preventing pollution rather than controlling it is EPA's preference.

Enron appreciates the opportunity to comment on the guidance document, If you have any questions concerning these comments, please contact me at (713) 646-7646,

Sincerely,

/s/

Marc N. Phillips
Manager
Regulatory Technical Analysis
Environmental, Health and Safety

Document 14

September 18, 2000

Mr. John S. Seitz
Director
Office of Air Quality Planning and Standards
United States Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Dear Mr. Seitz:

We have reviewed the United States Environmental Protection Agency's (U.S. EPA) preliminary draft guidance on Best Available Control Technology (BACT) for NOx control on combined cycle turbines. Based on our review we have significant concerns with some of the arguments presented in the guidance and the potential overall impact of the guidance on the BACT determination process.

The basis for U.S. EPA's proposed guidance is the consideration of collateral environmental impacts associated with the use of selective catalytic reduction (SCR) as BACT for oxides of nitrogen (NOx) on dry low-NOx equipped natural gas-fired combined cycle turbines. Although we are not disagreeing with the identification and discussion of potential collateral impacts, we are concerned that U.S. EPA guidance will be used to relax current BACT requirements and will ultimately lead to a lost opportunity to control emissions. SCR may not be the most desirable control technology for NOx, but it is a proven technology that provides for substantially lower emissions than dry low-NOx combustors alone. Comparing emissions on an annual basis, a 500 megawatt gas-fired combined cycle power plant at the current California BACT/lowest achievable emission rate (LAER) level of 2.5 ppmvd will emit approximately 150 tons per year of NOx. Increasing the BACT threshold to 9 ppmvd results in an additional annual increase of roughly 390 tons per year of NOx. This is a significant increase in emissions that should weigh heavily in any BACT determination.

While the potential impacts of ammonia slip from the use of SCR are thoroughly discussed in the proposed guidance, there was very little discussion of the feasibility of lowering ammonia slip levels. Air Resources Board (ARB) staff believe it is both feasible and cost effective to lower ammonia slip levels from the current 10 ppmvd to levels well below 5 ppmvd. Our conversations with SCR vendors and parties involved with system design and installation support ammonia slip levels less than 5 ppmvd as being readily achievable. Although ammonia slip levels below 5 ppmvd may shorten the life of the catalyst, it is our understanding that many SCR units are operating well beyond warranty periods and predicted useful lives.

The U.S. EPA guidance suggests that alternatives to SCR are currently not available for large gas turbine projects. Specifically, the SCONOX technology is singled out as being cost prohibitive and not yet proven on large combined cycle gas-fired turbines. ARB staff disagrees that viable technology options are not available. The SCONOX technology is commercially available and is currently being proposed for two large combined cycle turbine projects in California. The goal for both of these projects is to lower NOx emissions to no more than 1 ppmvd at 15 percent oxygen. This emission level is half of what is currently being achieved with SCR.

Preliminary cost estimates show that the SCONOX technology is cost effective. In addition, we believe there are no scalability issues with using SCONOX on large combined cycle gas-fired turbines.

Another technology that should be considered is the XONON Catalytic Combustor. This technology is currently being proposed on a 500 megawatt combined cycle gas-fired turbine project in California. The goal for this technology is to surpass the NOX levels achievable with SCR. One of the major advantages of the XONON technology is that it is an integral part of the gas turbine system and no aftertreatment technology is required. We understand that GE has been working closely with XONON in evaluating the technology for use with GE turbines and is actively pursuing a pilot project.

One area of particular concern in the proposed guidance is a discussion of potential emission increases by forcing the use of SCR. The rationale behind the argument for increased emissions is that if expensive add-on controls such as SCR are required, less new lower emitting facilities will be built in favor of continuing to operate older higher emitting existing facilities. Our experience over the last two years in California shows that this argument is simply not true. As a result of the electricity market deregulation, California is experiencing a significant growth in new potential electric generation. Currently, the State has received applications for licensing of seventeen large combined cycle gas-fired turbine power plants, with an additional twenty applications expected over the next two to three years. To date, five projects have been approved and are undergoing various stages of construction. Each proposed power plant will be licensed at or below 2.5 ppmvd NOx at 15 percent oxygen. In addition, a number of the existing older power plants are proposed to be re-powered with large combined cycle turbines to stay competitive in the open market.

ARB staff believes that there will eventually be a movement away from SCR to other non-ammonia based technologies that will potentially exceed the performance of SCR with little, if any, collateral impacts. Allowing less stringent BACT levels will remove the incentive for power producers to pursue alternative technologies.

Overall, we believe the U.S. EPA guidance presents a one-sided view of determining the appropriate level of BACT for combined cycle gas-fired turbines. The guidance needs to be balanced by providing a full discussion of collateral impacts, alternative technologies, and other issues that should be considered by state permitting authorities in establishing BACT. At a minimum, the guidance should be modified to make it clear that collateral impacts should only be used in doing an analysis of potential environmental impacts from ammonia slip when using SCR. The guidance should be clarified to come across as not taking a position one way or the other with regard to a state's decision of what the final BACT decision will be.

Thank you for the opportunity to comment. If you have any questions I can be reached at (916) 445-0650, or have your staff contact Mr. Raymond E. Menebroker, Chief, Project Assessment Branch, at (916) 322-6026.

Sincerely,

/s/

Peter D. Venturini, Chief
Stationary Source Division

cc: Mr. Raymond E. Menebroker
Project Assessment Branch

Document 15

Pam:
Attached is a revised copy of joint comments on the Draft Guidance on BACT for DLN NOx turbines. The comments filed yesterday (September 18th) identified 19 public health and environmental organizations as signatories. Four other groups were inadvertently omitted, and have been added to the signature pages at the end of the comments, for a total of 23 signatories. No other changes have been made.

The file is Microsoft Word Windows 95 Version 7.0. If you experience any difficulty opening the file or printing please cont

Patricio Silva
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Natural Resources Defense Council
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(202) 289-2398
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September 18, 2000

Comments on EPA's Draft Guidance on "Consideration of Collateral Environmental Impacts Associated with the Use of SCR at Dry Low NO_x Combined Cycle Natural Gas Turbines"
65 Federal Register 50202 (August 17, 2000)

Introduction and Summary of Comments

On August 17, 2000, the United States Environmental Protection Agency (EPA) requested public comment on draft guidance on the best available control technology (BACT) for NOx control for natural gas-fired combined cycle turbines (Draft Guidance). 65 Fed. Reg. 50202. The undersigned organizations thank EPA for the opportunity to comment on the Draft Guidance, which addresses the "collateral environmental impacts" under BACT of using selective catalytic reduction (SCR) on certain natural gas turbines. These "dry low NO " (DLN) turbines typically emit a lifetime average of 9 parts per million dry volume (ppm) of nitrogen oxides (NOx) without any post-combustion controls.

Although often couched in ambiguous phrasing, the Draft Guidance clearly establishes a strong presumption against the application of SCR for DLN turbines, even though SCR can reduce NOx emissions from DLN turbines to 2 ppm, and other technologies are emerging that may replace SCR: "In some situations, however, the collateral environmental impacts associated with the use of ammonia with SCR may justify not requiring SCR on DLN turbines." The Draft Guidance identifies several alleged collateral environmental impacts involving SCR: 1) requiring SCR (or any other pollution control) would increase NO emissions nationally, due to more power generation by cheaper, dirtier sources; 2) ammonia safety and waste issues; and 3) environmental impacts associated with ammonia slip from SCR operation.

While EPA's rationales for the Draft Guidance are conflict with the legal requirements of the Clean Air Act, the policy dilemma EPA claims to address in the Draft Guidance does not exist, as neither the capital nor operating cost for SCR control systems changes the number of combustion turbine projects built nor the order in

which those units are then dispatched. We therefore cannot agree with EPA's contention that the imposition of SCR

control technology on DLN combustion turbines will increase NOx emissions.

We strongly oppose the Draft Guidance because it is hastily conceived, one-sided, and regressive for BACT. More specifically:

- The Draft Guidance seriously undermines the BACT review process.
- EPA's market displacement theory unlawfully "freezes" BACT.
- SCR already is an accepted, achievable technology for DLN turbines.
- The Draft Guidance impermissibly shifts an important burden of proof from the applicant to the permitting authority.
- EPA's science and technology assumptions are wrong.
- EPA overstates ammonia slip and understates NOx emissions.
- The ammonia safety and waste issues are red herrings.
- Comparing NOx and ammonia emissions requires a site-specific analysis.
- The market displacement theory is wrong on the facts and therefore the Draft Guidance is arbitrary.
- SCR's capital and operating costs are too inconsequential to significantly affect cleaner electric power investment or dispatch decisions.
- Combined cycle technology will dominate new electric production capacity for the next 20 years.

As applied only to DLN turbines, the Draft Guidance effectively "freezes" BACT by declaring that the addition of any post-combustion control technology for DLN turbines will actually increase NOx emissions nationwide. More generally, the Draft Guidance sets a dangerous precedent across the power generation industry, despite EPA's assertion that it applies only to DLN turbines. Based on the logic of EPA's electricity market displacement theory, any permit applicant could argue that imposing more expensive pollution control technology will cause a shift in the sequence of power dispatch. EPA's market displacement theory violates BACT, and it is wrong on the facts.

We also are concerned that the Draft Guidance superficially addresses important environmental topics. The Draft Guidance overstates ammonia slip and understates NOx reductions achievable with SCR, thereby creating an artificial equivalence where none exists. In the case of the ammonia safety and waste issues, EPA inexplicably first concludes that neither issue justifies a decision to reject SCR, yet also concludes that taken together they add weight to a decision against SCR. That determination flies in the face of legal and industry precedent.

The Assistant Administrator for Air and Radiation has recently stated that: "[a]lthough NOx emissions from new combustion turbines with dry low- NOx (DLN) combustors are less than those from the prior generation of combustion turbines, they still constitute a sizeable emission source which warrants the evaluation of all available control options." In other words, not requiring SCR or an equivalent NO control technology on DLN turbines could result in thousands of tons of additional NOx emissions annually. Yet the Draft Guidance may have exactly that effect.

Adoption of the Draft Guidance would establish settled and final agency legal interpretations that will be subject to judicial review in the United States Court of Appeals for the District of Columbia Circuit upon issuance. These legal interpretations misapply the criteria governing the establishment of BACT in violation of EPA regulations and the Clean Air Act, in order to authorize DLN turbine NO emissions of 9

x

ppm as BACT. The Draft Guidance also misinterprets these criteria in order to allow SCR and other control technologies *not* to be required as BACT, when proper application of these criteria has shown – and would show – that SCR or other control technologies are required as BACT. The clear purpose of the Draft Guidance is to create rights and authorize actions that are not allowed under current law, and would not be allowed or undertaken without the stamp of EPA permission and approval. Accordingly, adoption of the Draft Guidance would result in unlawful legal interpretations and final agency action that will be subject to judicial challenge and judicial vacatur.

EPA needs to more carefully consider the issues raised in the Draft Guidance before establishing a national policy that likely will cause NO_x emissions to increase by thousands of tons per year. For the most part, the major justifications in the Draft Guidance are illegal, exaggerated, unsubstantiated, or generalized, and lack the requisite clarity required for a major national change in BACT policy. We therefore recommend that EPA withdraw the Draft Guidance immediately. (Simply allowing the Draft Guidance to remain "on the books" in draft form is unacceptable.) In its place, we will support a public and stakeholder process that comprehensively and transparently addresses the legitimate air pollution control issues implicated in the development of low-pollution, high-efficiency power generation technologies.

Discussion

I. THE DRAFT GUIDANCE SERIOUSLY UNDERMINES THE BACT REVIEW PROCESS.

Stationary sources, including gas turbine projects, located in attainment areas are required to obtain a prevention of significant deterioration (PSD) permit and apply BACT to limit emissions of pollutants. BACT is defined as:

> [A]n emissions limitation based upon the maximum degree of reduction of each pollutant subject to regulation under this chapter emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable for such facility.

42 U.S.C. § 7479(3) (Clean Air Act § 169(3)).

BACT review, as implemented by EPA and the States, encourages the development of progressively more effective power generation and pollution control technologies. In the case of the DLN turbine, for example, GE commendably has developed a low- NOx, high-efficiency turbine that currently emits, on a lifetime average, NOx levels as low as 9 ppm. But pollution control technologies also have progressed to the point where SCR and other developing technologies can further reduce NOx emissions in even DLN turbines to as low as 2 ppm. Although some may argue that the difference may seem low in isolation, the reduction amounts to hundreds of tons per year of NOx on larger combined cycle turbine facilities, and thousands of tons of NOx reduction nationwide. By presumptively declaring that DLN turbine NOx emissions of 9 ppm are acceptable, EPA is threatening the development and commercialization of novel and innovative pollution control technologies, including multi-pollutant control technologies, which BACT otherwise favors.

A. The Market Displacement Theory Unlawfully "Freezes" BACT for DLN Turbines and Other Sources.

One of EPA's major arguments against SCR in the Draft Guidance is that SCR increases the capital and operating costs of combined cycle units in relation to other, dirtier power generation sources. According to EPA, "[i]f SCR is required on a new DLN turbine, the added capital and operating costs of SCR may mean that more electricity will be produced by dirtier plants. This could occur because fewer of these new plants will be built and because less electricity will be generated from those that are built."

This market displacement theory has broad and sweeping negative consequences. As stated by EPA, the theory provides justification against installing <u>any</u> more expensive pollution control technology on DLN turbines. By EPA's logic, any post-combustion or other emission control technology required on DLN turbines would increase electricity production by dirtier plants, since the technology would add capital and operating costs to the new units. Consequently, the market displacement theory would effectively designate the DLN combined cycle turbine alone as BACT, even though cost-effective technology can reduce NO_x emissions to as low as 2 ppm. This market-freezing effect would occur regardless of whether the control technology used ammonia to reduce NOx emissions, since ammonia slip is not a factor in the market displacement theory.

The market displacement theory also would strongly discourage the development of any new control technology for either combined cycle or single cycle operation. Indeed, EPA's theory could apply to the development of any new power technology that is more expensive than DLN turbines. Given these serious adverse consequences, we recommend that EPA renounce its novel and regressive approach to emission control, which plainly violates BACT.

B. SCR Already Is an Accepted, Achievable Technology for DLN Turbines.

Astoundingly, the Draft Guidance ignores substantial numbers of recent combined cycle pending or final permits involving SCR on DLN turbines. EPA Region and State regulatory staff conducting BACT determinations for advanced combined cycle gas turbine electric generation projects now routinely determines that SCR control technology, reducing NOx emissions to the 3.5-5 ppm range, is warranted under the Clean Air Act. These determinations have been made through the proper application of the BACT criteria, without the biasing influence of the Draft Guidance. According to EPA Region 4, "[a]lthough dry low- NOx combustors such as the ones proposed by the applicant are less polluting than those from the prior generation of combustion turbines, the sheer number of combustion turbine projects represents a significant addition to U.S. emissions and raises the need to reduce NOx emissions from these sources to the extent practicable." Surprisingly, the Draft Guidance does not discuss any of these numerous permit decisions.

A review of national permitting data, compiled by EPA Region 4, for single and combined cycle combustion turbine projects, including 186 projects involving over 750 combustion turbines where turbine manufacturers were identified, reveals that since 1998 developers in 124 projects selected combustion turbines manufactured by GE Power Systems. Ninety projects involved orders for the GE 7FA turbine frame, and in 44 projects the developers selected the combined-cycle version of the GE 7FA turbine equipped with SCR control technology. The latest version of the GE 7FA turbine frame incorporate DLN 2.6 technology, reducing NO emissions to 9 ppm. In the BACT determinations for many of these combustion turbine projects regulators required SCR to limit NOx emissions. Some 260 combustion turbines were equipped with SCR to limit NOx emissions. Three combustion turbine projects will limit NOx emissions with SCONOX control technology, while a fourth gas turbine project selected XONON control technology to limit NOx emissions. Based on this data alone, EPA should conclude that the "collateral environmental impacts" of SCR do not generally disfavor its use. Instead, the Draft Guidance ignores this data. This alone renders the Draft Guidance arbitrary. These data also seriously undercut GE's concern that "GE could lose orders currently pending if SCR is determined to be required for the 9ppm [DLN turbine]." Indeed, according to a recent EPA Region 4 permit review letter:

> For the majority of recent combined cycle combustion turbine facilities of which we are aware (including those with and without duct burner supplemental firing), BACT for natural gas firing has been used for an add-on control with a DLN combustor to achieve an emission rate on the order of 3.5 ppmvd.

The national permitting data for combustion turbine projects compiled by EPA Region 4 indicates that in 186 combustion turbine projects permitted between 1998 and July 2000, SCR was required on single and combined cycle turbines at 109 projects, affecting 59 percent of the projects, representing over 53,000 megawatts (MW) of generating capacity. Of this total, approximately 15,500 MW was permitted to a NO level of 2.0 to 2.5 ppm. Most of these projects are in ozone-nonattainment areas subject to LAER reviewx LAER decisions are relevant because they reflect the maximum possible emission reduction achievable.

Assuming that SCR costs continue to decline, LAER-level emissions are more likely to become cost-effective under BACT.

If EPA's premise in the Draft Guidance that requiring SCR on DLN gas turbines in BACT determinations would result in fewer DLN units being deployed, then one would expect orders for GE DLN combustion turbines to stagnate as developers migrated to competing models. Yet GE Power Systems has installed over 200 GE DLN combustion turbines worldwide and is enjoying high domestic demand for single and combined cycle turbines equipped with DLN technology. GE Power Systems dominates both the domestic and international combined cycle gas turbine markets, enjoying a 70% share of domestic market for combustion turbines in large-scale electric generation and cogeneration applications. GE Power Systems reported a $23 billion backlog for gas turbines and expects to produce 240 units in 2000 alone. In early March 2000, GE Power Systems announced a purchase order agreement worth $4 billion with Duke Energy for 84 combustion turbines all to be equipped with DLN NO_x combustion control systems. Demand for combustion turbines for electric generating applications is so robust that all turbine manufacturers are reporting substantial production backlogs, with deliveries of orders received this year being scheduled for 2004 and after. This explosive increase in demand has occurred with permitting authorities requiring SCR for combined cycle combustion turbine projects.

C. The Draft Guidance Impermissibly Shifts the Burden of Proof from the Permit Applicant to the Permitting Authority.

Normally, BACT's "top-down" selection process places the burden of proof on a permit applicant to justify why a proposed source is unable to apply the best technology available. By establishing a strong presumption against SCR, despite evidence to the contrary, the Draft Guidance impermissibly shifts the burden of proof to the permitting authority to show why SCR should apply.

The burden-shifting is particularly egregious in this case because the Draft Guidance "piles on" several arguments against SCR specifically and pollution controls in general for DLN turbines. Individually, these arguments either are meritless or are better reviewed at the "case-by-case" level for each facility. As written, however, the Draft Guidance impermissibly allows a permit applicant, or permit authority, to argue that the cumulative weight of these otherwise weak or unlawful arguments is sufficient to determine that the application of SCR and conceivably other pollution control technologies are inappropriate for DLN turbines, even if they are otherwise cost-effective under BACT. This result seriously undermines the technology-forcing intent of BACT, and is unlawful.

II. EPA'S SCIENCE AND TECHNOLOGY ASSUMPTIONS ARE WRONG.

A. EPA overstates ammonia slip from SCR, and understate NO_x reductions, thereby arbitrarily creating an equivalence where none exists.

EPA's Draft Guidance rests on the mistaken assumption that SCR achieves a NOx reduction on DLN turbines that is "roughly equivalent" to the amount of ammonia slip from SCR systems. In fact, the ratio of NO_x reduction to ammonia slip is between 2 to 1 and 6 to 1. EPA's incorrect characterization of the ratio as "roughly equivalent" flows largely from the mistaken assumption that SCR ammonia slip may be as much as 5 to 10 ppm. Ammonia slip actually is much closer to 2 to 3 ppm on average over the catalyst lifespan. Moreover, SCR reduces NOx by 7 ppm or more. Consequently, NOx reduction and ammonia slip generally are not equivalent, the Draft Guidance is without technical basis, and EPA should withdraw its ill-conceived attempt to roll back BACT.

1. Ammonia slip typically is 2-3 ppm over the life of the SCR catalyst.

EPA's Draft Guidance characterizes ammonia slip emissions as "often less than 5 to 10 ppm ammonia." This statement is ambiguous, and the Draft Guidance does not attempt to characterize actual ammonia emissions in detail. Nevertheless, putting aside the ambiguity, the Draft Guidance's "rough equivalence" conclusion depends on actual and typical levels of ammonia slip in the 5 ppm to 10 ppm range. Otherwise, equivalence would not exist, and the Draft Guidance would be without justification. In truth, EPA's ammonia slip estimate is up to ten times greater than actual ammonia slip. Ammonia slip, like NO_x emissions from DLN turbines, is a design factor, and the ammonia slip limit has trended downward over the last decade. Typically, catalysts today may be designed to emit no more than 5 ppm of ammonia slip, which means that over the life of the catalyst the average ammonia slip is closer to 2 ppm. Even lower ammonia slip occurs on units designed to 2 ppm. Therefore, EPA's assumption that SCR results in ammonia slip on average of even 5 ppm is erroneous.

SCR can achieve these low ammonia slip levels for at least two reasons. The major reason is that most SCR manufacturers typically guarantee their units to no more than a 5 ppm ammonia slip limit for combined cycle applications (although a few designs still specify a 10 ppm limit). According to the Institute of Clean Air Companies (ICAC) some vendors are now guaranteeing ammonia slip from SCR equipped combustion turbines at 2 ppm or less. This guarantee applies regardless of whether the air permit for the facility includes an ammonia limit or condition. To consistently meet the guaranteed limit, SCR units actually emit far lower than the guaranteed limit during the life of the catalyst. The catalyst is replaced when the ammonia slip approaches the guaranteed limit.

SCR catalysts used on gas-fired turbines have a life of up to 10 years or more. If an SCR unit is designed to a 5 ppm ammonia slip level, the ammonia slip will be virtually undetectable during the first few months of operation, and then rise very slowly over the years, reaching the 5 ppm level only in the final stage of catalyst operation. Thus, a catalyst guaranteed to 5 ppm actually will average only approximately 2 ppm to 3 ppm over the life of the catalyst, not 5 ppm to 10 ppm as indicated in the Draft Guidance. (Confirming this position, the Background Document reports that ammonia slip from an SCR catalyst installed in 1986 in a gas-fired turbine began operating with an ammonia slip of 2 ppm, and now is at 4 ppm without any catalyst replacement.)

Some states specify an ammonia emission limit for combined cycle turbine facilities. As EPA correctly notes, when a combined cycle turbine is subject to a 5 ppm ammonia limit, the actual ammonia slip is far lower, since, as explained above, SCR vendors design the equipment with a comfortable margin of error. Consequently, SCR units subject to a 5 ppm ammonia slip permit condition emit an average ammonia level of 2 to 3 ppm over the life of the catalyst. (Moreover, as more permits require 5 ppm, permit applicants will be increasingly hard-pressed under BACT to justify a 10 ppm limit.)

The 3 ppm to 7 ppm difference between EPA's claimed ammonia slip limit is significant because it means that actual ammonia slip is up to 90 percent or more less than the 10 ppm level that EPA asserts as an upper limit, and that GE claims as the actual ammonia slip level. Consequently, the lower ammonia slip in current design SCR units invalidates a major factual basis for the Draft Guidance.

2. Since the actual ratio between NO_x emissions reduction and ammonia slip is between 2 to 1 and 6 to 1, the Draft Guidance is without Technical Basis.

Ammonia slip from current generation SCR units is approximately 2 ppm over the life of most units, and trending downward. Average NOx reductions from most SCR-equipped DLN turbines subject to BACT range from 4.5 ppm (assuming a 4.5 ppm NOx permit limit) to 6.5 ppm (assuming a 2.5 ppm NOx limit). Consequently, the actual ratio between ammonia slip and NOx reduction ranges up to 6 to 1 early in the life of the catalyst. Moreover, since the molar weight of NOx is double or more that of ammonia, annual emissions of NOx are much greater than for ammonia. The table below summarizes the actual levels of NOx reduction and ammonia slip achieved by SCR on DLN turbines, and corrects the data included in GE's advocacy materials submitted to EPA.

Corrected Emissions Comparison of DLN Gas Turbine With and Without SCR

NOx Limit (ppm)	**NOx Emissions (tpy)**			**Total NOx Reduction (ppm)**	**Ammonia Emissions (tpy)**
	1 ppm	**2 ppm**	**3 ppm**		
9 (no controls)	260	--	--	--	--
4.5	130	4.5	10.5	21	31.5
3.5	101	5.5	10.5	21	31.5
2.5	72	6.5	10.5	21	31.5

Note: emissions information is from GE advocacy materials submitted to EPA entitled "GE DLN Gas Turbines Provide Single Digit NOx Emissions of 9 ppm w/o Add-On Controls," p. 1. GE did not provide detailed support for the baseline emission assumptions, which we assume to be true solely for the purpose of correcting GE's ammonia emission predictions.

Ammonia slip plainly is not "roughly equivalent to NOx reductions in most cases. If ammonia slip is an issue in site-specific circumstances, the appropriate and obvious solution is to specify an ammonia limit in the permit. More states are following this approach, and as a result ammonia slip levels are decreasing and new control technologies are developing that reduce or eliminate ammonia slip. Likewise, if NOx reduction is small for a particular project, SCR may be too costly to justify in the permit. Regardless of whether the issue is ammonia slip or cost-effectiveness, the issue should be addressed in the permit review process, and not in a national guidance document with generalized and invalid technical claims.

3. Next-generation SCR and other control technology are likely to emit little or no ammonia.

Ammonia slip is not inherent in SCR design. Next-generation SCR technologies may further reduce or eliminate ammonia slip, for example by catalyzing unreacted ammonia in the exhaust stream. According to ICAC, "advanced SCR systems are under development that show promise in reducing ammonia slip to undetectable levels throughout the life of the system. New NO_x reduction technologies are emerging, such as SCONOX™ and XONON™, that do not use ammonia and achieve emission rates as low as 1 ppm. Although these technologies are in limited commercial use, they likely will continue to grow in use during the next decade. Therefore, by 2010 SCR may not be the dominant after-treatment NO_x control technology. EPA's Draft Guidance largely fails to take into account the development of new technologies, and its IPM predictions erroneously assume that SCR will continue to be used on eligible combined cycle units. Given that SCR ammonia slip will decline further, the Draft Guidance's 5 ppm to 10 ppm claim is even less plausible five to ten years into the future.

B. The Ammonia Safety Issue Is a Red Herring.

Both the Draft Guidance and the Background Document discuss ammonia safety. Tens of thousands of

megawatts of coal and gas power generation use SCR without apparent safety problems, and a ruling by the EPA Administrator rejects ammonia safety concerns as a reason not to use SCR. EPA nevertheless concludes, without any supporting evidence or basis, that ammonia safety issues "add weight to the decision not to require SCR." Without supporting evidence, even this equivocal conclusion is arbitrary. Although EPA does allow that ammonia safety itself "should have very little influence on a decision," the Agency's ammonia safety discussion, together with other illusory concerns discussed in the Draft Guidance, create an unfair presumption against SCR in DLN.

The Draft Guidance itself makes a strong case for dismissing the ammonia safety claim in the context of BACT review for SCR:

- Industry sources could not identify a single instance of ammonia-related accidents resulting from SCR use.

- Although three facilities that submitted Risk Management Plans (RMP) to EPA reported ammonia releases that caused 12 reported injuries (itself a better accident record than for facilities in general), those releases involved anhydrous ammonia, whereas gas turbine power stations typically use aqueous ammonia, which is considerably less dangerous to handle. Therefore, those release incidents do not support a finding that ammonia safety is a concern.

- The Environmental Appeals Board, in the Kawaihae Cogeneration Project decision, rejected out of hand the argument that a "purely hypothetical catastrophic failure of the SCR ammonia system" constituted a collateral environmental impact in the BACT analysis. This decision is dispositive of the ammonia safety issue in the context of SCR selection for DLN or any other turbines.

More recently, in rejecting an ammonia threat claim, EPA Region 4 has confirmed that ammonia safety is a non-issue:

> The preliminary determination . . . includes a statement recognizing the environmental disadvantages of "anhydrous" ammonia. The applicant, however, bases the BACT evaluation on aqueous ammonia. Aqueous ammonia is usually the form of choice for large CT SCR systems and poses a much lower safety risk than anhydrous ammonia.

In summary, the facts and the law strongly support the conclusion that ammonia safety is not a collateral environmental impact in BACT review, no matter how many times permit applicants make the claim. Therefore, the issue does not "add weight" to a decision to not require SCR.

C. The SCR Catalyst Waste Issue Also Is a Red Herring.

The Draft Guidance and the Background document discuss the issue of catalyst waste. Although the facts presented in the Background Document compel the conclusion that catalyst waste is not a collateral environmental impact under BACT, the Draft Guidance finds otherwise, concluding that the "waste issues, when taken into consideration with other concerns, add weight to the decision not to require SCR . . . ." Because this conclusion is supported by EPA's own discussions and other available information, it is arbitrary and capricious and not a proper justification for the Draft Guidance conclusions.

The Background Document summarizes why catalyst waste is a non-issue in the context of a national BACT guidance document:

- Catalyst replacement for natural gas-fired units occurs infrequently, on the order of 7 to 10 years or more.
- Spent catalyst is frequently regenerated or recycled (acid wash, hot water bath, ultrasonic cleaning, abrasive cleaning), thereby entirely eliminating the waste disposal issue.
- Spent catalyst that is disposed of is not a listed hazardous waste, and typically is not a characteristic hazardous waste.

These reasons should be sufficient justification for EPA to conclude that catalyst waste is not a significant issue, either alone or in combination with other issues. Some catalysts installed in SCR systems at natural gas-fired combustion turbine over a decade ago are still operating with little degradation in NOx removal efficiency, in part since the catalyst does not experience fouling more common in SCR systems at coal-fired boilers. In summary, the Background Document and other information on spent catalyst demonstrate that catalyst waste is not an issue deserving BACT review, unless site-specific circumstances justify rebutting the presumption in favor of SCR.

D. Comparing NOx and Ammonia Emissions Is Complex and Requires a Site-Specific Analysis.

EPA accurately recognizes that the tradeoffs between NOx and ammonia emissions are "not simple." As required by BACT, a site-specific analysis of environmental conditions is necessary to determine whether, in particular cases, ammonia slip will adversely impact the environment more than the reductions in NOx achieved by SCR. "The analysis may take the form of comparing the incremental environmental impact of alternative emission control systems with the control system proposed as BACT; however, as in any BACT determination, the exact form of the analysis and the level of detail required will depend upon the facts of the individual case."

At a basic level, a direct comparison of NOx and ammonia emissions should take into account that the molar weight of NOx emitted from gas turbines is at least double the molar weight of ammonia. Combustion turbine exhaust gas typically consists of 80 percent NO and 20 percent NO2. The molar weight of ammonia (NH_3) is 17; the molar weight of NO is 30, and the molar weight of NO2 is 46. Therefore, one ton of ammonia slip is equivalent to approximately two tons of NOx emissions from a gas turbine. EPA does acknowledge this difference in the Draft Guidance (p. 9, footnote 6). Consequently, ammonia emissions are likely to be much lower than NOx emissions (in terms of emitted nitrogen) on a weight basis.

When considering the ecosystem impacts of NOx and ammonia emissions, SCR may produce a better net environmental result then DLN turbines alone. For example, terrestrial ecosystems may be subject to unwanted fertilization through nitrogen deposition, which may cause changes in nutrient cycling and species composition. Recognizing the possibility of nutrient loading through nitrogen deposition and eutrophication, the Draft Guidance states that the tradeoff "should be made in favor of the option that decreases the total amount of oxidized and reduced nitrogen being emitted." That option is likely to be SCR or another control technology.

Likewise, in coastal and estuarine ecosystems that are susceptible to nitrogen-induced eutrophication, the option that reduces nitrogen loading is desirable. Again, that option is likely to be SCR or another control technology.

For acidifying deposition, limiting both NO_x and ammonia emissions is important. The Draft Guidance states that ammonium deposition can be twice as acidifying as nitric acid if the ammonium has undergone microbial nitrification. The Draft Guidance incorrectly concludes, however, that "acidification impacts tend to weigh more in favor of limiting ammonia emissions and not requiring SCR." If acidification is a concern,

SCR may still be appropriate if NO$_x$ emissions are more than two times greater than the ammonia slip emissions. As explained earlier in these Comments, ammonia slip is decreasing with the development of new technologies; therefore, EPA's generalized conclusion is inappropriate. Thus, as with the other environmental considerations discussed in the Draft Guidance, the analysis must be permit-specific, and focus on the selected equipment and actual environmental conditions.

III. THE MARKET DISPLACEMENT THEORY VIOLATES BACT.

Under BACT, the permitting authority determines, "on a case-by-case basis, taking into account energy, environmental, economic impacts and other costs," the most stringent pollution limit achievable "for such facility." 42 U.S.C. § 7479(3). BACT focuses on site-specific circumstances applicable to each proposed source. As EPA concedes, the issue of whether a SCR requirement will cause dirtier plants to displace cleaner combined cycle facilities is national in scope. Therefore, as framed by EPA, consideration of national energy trends and electricity market activity for the purpose of selecting control technology is entirely outside the scope of BACT (and LAER) permit review.

During the Senate debate on the 1977 amendments to the Clean Air Act, the late Senator Edmund Muskie explained the purpose of the "case-by-case" collateral impacts evaluation in BACT review:

> One objection which has been raised to requiring the use of the best available pollution control technology is that a technology demonstrated to be applicable in one area of the country is not applicable at a new facility in another area because of difference [sic] in feedstock material, plant configuration or other reasons. For this and other reasons, the committee voted to permit emission limits based on the best available technology on a case-by-case judgment at the State level. This flexibility should allow such differences to be accommodated and still maximize the use of improved technology.

Simply put, BACT's case-by-case review requirement "operates primarily as a safety valve whenever unusual circumstances specific to the facility make it appropriate to use less than the most effective technology. The permit applicant must install the most effective technology if it fails to demonstrate to the satisfaction of the permit issuer that such unusual circumstances exist." Decisional precedent is clear on this point.

In the Columbia Gulf Transmission decision, the proposed NO$_x$ control technology would have reduced annual NOx emissions from 193 tpy to 79 tpy. The State of Kentucky had argued the reduction would have only a modeled negligible benefit on air quality, which was outweighed by the cost of $2,121/ton of NOx removed. EPA rejected this argument, ruling that the collateral impacts clause served to "focus on local impacts that constrain the source from using the most effective technology. . . . [T]he negligible air quality impact of the proposed NOx emissions is clearly not a constraint on implementing the most effective technology."

Compared to the facts in Columbia Gulf Transmission, EPA's market displacement theory prediction of nationwide increased NO$_x$ emissions is even further outside the legally permissible scope of BACT review. First, EPA's prediction assumes that all or substantially all DLN turbines are required to install SCR. In Columbia Gulf Transmission, the State only considered the impacts of the single facility. Second, EPA's market displacement theory assumes a national increase in NO$_x$ emissions. In Columbia Gulf Transmission,

the modeled impact concerned the local ambient air quality.

Given the broad national assumptions and conclusions inherent in the market displacement theory, a permit writer simply could not rationally consider the theory in the context of BACT review. Moreover, EPA's market displacement theory provides no basis or methodology for determining whether a specific facility's use of SCR would cause an increase in emissions from other, dirtier sources. Thus, as described by EPA, the national market displacement theory violates BACT.

IV. EPA'S SPECULATIVE MARKET DISPLACEMENT THEORY IS WRONG ON THE FACTS.

In this part of the Comments we identify several basic reasons why EPA's predicted rise in NO emissions likely will not occur. We do not attempt to identify every flawed assumption in EPA's prediction that NOx emissions will increase if SCR or another control technology is considered for combined cycle turbines under BACT. Instead, we focus on several basic cost and economic growth factors in the electricity production market to demonstrate why EPA's prediction is unreasonable and unlikely to occur. We note, however, that even if all of EPA's predictive modeling assumptions were reasonable (they are not), and even if market displacement were a valid legal consideration under BACT (it is not), a one-sided, hastily-conceived BACT guidance document is not the place to create a national policy on electric generation.

A. SCR's Capital and Operating Costs Are Too Inconsequential to Affect Cleaner Electric Power Investment or Dispatch Decisions.

EPA asserts that, if SCR technology is required on DLN turbine units in combined cycle configurations under BACT, NO emissions nationwide actually could increase slightly by 2010. EPA's predicted increase from 4,132,113 tons per year (tpy) without SCR to 4,147,240 tpy with SCR (an increase of 15,127 tpy). According to EPA, this result would occur because "[i]f SCR is required on a new DLN turbine, the added capital and operating costs of SCR may mean that more electricity will be produced by dirtier plants [e.g., coal-fired plants]. This could occur because fewer of those plants will be built and because less electricity will be generated from those that are built." (As we explain in Part I of these Comments, EPA's rationale could apply broadly to any pollution control technology potentially applicable to DLN turbines.)

Neither SCR economics nor electricity market conditions support EPA's conclusion. The three primary reasons why EPA's outcome will not occur is that: 1) SCR's capital cost is only five percent or less of the total capital cost of new combined cycle generation; 2) SCR's low variable operating cost (less than one percent of total running cost) is too small to affect electricity dispatch decisions; and 3) combined cycle units will be the fastest-growing segment of the electricity production industry in the next 20 years. Therefore, neither capital investment nor dispatch decisions are likely to depend on whether SCR is required on new DLN turbine units.

1. The capital cost of SCR is too insignificant to affect capital investment decisions.

Even EPA recognizes that the add-on capital cost of SCR is "modest." According to EPA data, the capital cost of SCR is approximately five percent of the total capital cost of a new combined cycle natural gas turbine facility. Specifically, SCR costs approximately $28 per kilowatt (kW), compared to a total capital cost (including SCR) of $617/kW (1997 $). EPA also predicts that the capital cost of combined cycle units (including SCR when appropriate) will decline by 2010, to $367/kW, making the units even more economically attractive to power developers. In contrast, the capital cost of a pulverized coal-fired unit is

predicted to remain constant at $1377/kW through 2010, which is nearly four times the cost of a 2010 CC unit. Therefore, given the low future cost of combined cycle power (including SCR when required by BACT) relative to pulverized coal for baseload generation, and SCR's low capital cost, the add-on cost of SCR is unlikely to discourage investment in combined cycle generation.

2. SCR's low running cost (less than one percent of the total running cost) will not affect electricity dispatch decisions.

The Draft Guidance asserts that an SCR requirement will increase combined cycle operating costs sufficiently to lower the dispatch order of the unit relative to less expensive, dirtier units:

> An increase in operating costs [resulting from SCR] also is reflected in a lower dispatch order so that even very small increases mean that the generating unit is run less often and the difference is made up by another unit that is less expensive to operate. Often these less expensive plants emit more NO and [sic] than natural gas combined cycle generation with or without SCR. x

EPA's tenuous conclusion is based on the assumption that "new natural gas combined cycle plants produce electricity more cheaply than many older steam generating units." Increasing the cost of combined cycle generation by adding SCR could, in EPA's view, increase operating costs sufficiently to cause the units to drop in the dispatch order.

We disagree with EPA's conclusion. Adding SCR when required by BACT is not likely to affect the dispatch order of generating units because: a) SCR's operating cost is low (typically 1 percent or less of the total running cost); and b) the total operating cost of combined cycle generation typically is significantly more than the existing operating cost of baseload coal-fired units. Therefore, adding SCR will not affect the order of dispatch in nearly all cases.

To be clear, a plant's running (or variable) cost, which consists of fuel and variable operating and maintenance expenses, is the primary factor in determining dispatch order. Fixed operating costs and capital costs play very little role. Even in close cases, the comparatively low operating cost of SCR is unlikely to change the order of dispatch, since the running cost of SCR is much less than the difference between combined cycle without SCR and coal-fired power. EPA's predicted change in dispatch order therefore is unlikely to occur.

a. The running cost of SCR is significantly less than one percent of the running cost of a combined cycle unit.

According to EPA, the running cost of SCR alone is approximately 0.1 mill/kWh, or $0.0001/kWh (one one-hundredth of a cent). Also according to EPA, the total non-fuel running cost (including SCR) of combined cycle units in 2000 and 2005 is $1.1/MWh, or $0.0011/kWh (.11 cents). EIA forecasts that natural gas fuel for combined cycle units will cost 20.82 mills/kWh, or $0.021/kWH (2.1 cents). Thus, SCR's running cost is significantly less than one percent of the total running costs of combined cycle generating units.

b. Coal-fired power running costs usually are lower than combined cycle natural gas power running costs.

In general, coal-fired power is cheaper to produce than natural gas combined cycle power, despite the greater efficiency of combined cycle units. The primary reason is that natural gas fuel is more expensive than coal fuel. The overall difference in operating costs may range from $0.005/kWh to $0.010/kWh or more. The following Table summarizes the EIA's projected variable operating costs (including fuel) in 2005 and 2020 for new coal and combined cycle power.

Costs of Producing Electricity from New Plants -- 2005 and 2020 (1998 mills per kilowatt hour)

	2005		2020	
Item	***Coal***	***Combined Cycle***	***Coal***	***Combined Cycle***
O&M	4.58	2.03	4.58	2.03
Fuel	7.32	20.82	6.12	23.77
	Btu per kilowatt hour			
Heat Rate	9,253	6,639	9,087	6,350

Source: AEO 2000, p. 67, Table 9.

These data show that fuel costs dominate running costs for combined cycle generation, and that natural gas is considerably more expensive than coal. The data also show that combined cycle running costs are nearly twice those of coal-fired power. Independent data confirm the significantly higher running cost of combined cycle generation.

SCR represents less than one percent of the running cost of combined cycle generation. In general, coal-fired power often may be 50 percent less expensive than combined cycle generation. SCR's low operating cost therefore will not affect the dispatch order of units in virtually all cases.

B. Combined Cycle Technology Will Dominate New Electricity Production Capacity During the Next 20 Years.

The Draft Guidance argues that BACT determinations requiring SCR for DLN turbines will frustrate the penetration of this combined cycle technology in the electric generating market. This concern is misplaced, since short-term and long-term forecasts uniformly predict that advanced combined cycle natural gas turbines will capture a dramatic share of the electricity generation market. The Department of Energy's Energy Information Administration (EIA) now forecasts that combined cycle capacity will grow faster than previously predicted, and will be the fastest growing segment of the electric power industry through 2020. Of all new capacity, 90 percent will be combustion turbine technology.

Approximately 100 gigawatts in new generating capacity is under development across the United States, most of which will be powered by advanced combined cycle natural gas turbines, many operating in combined cycle mode with heat-recovery steam generators. EIA forecasts that, by 2020, an additional 300 gigawatts of electric generating capacity will be required to satisfy increasing domestic energy demand and replace retired fossil fuel-fired and nuclear generating units. Under any of the energy development cases forecast by the EIA, "gas technologies are expected to dominate new generating capacity additions." Other forecasts predict a similar significant increase in natural gas consumption for electricity generation.

EPA's prediction for combined cycle growth discussed in the Draft Guidance relied on older EIA data from 1997. For example, for year 2010, EPA predicted 741 billion kilowatt hours (bkWh) of oil and gas combined, of which approximately 700 bkWh is gas generation. (EPA's prediction did not break out gas and oil

separately.) In contrast, EIA's Annual Energy Outlook (AEO) 2000 forecasts 796 bkWh of gas generation in 2010 under base case growth assumption, and as much as 864 bkWh of natural gas generation under strong economic growth conditions. Thus, EPA's dated prediction underestimates growth by between 12 to nearly 20 percent.

Plainly, demand for new power plants is growing faster than previously forecast, and demand will continue regardless of whether SCR is specified in particular power plant construction permits. EPA's projections likely do not take the strong projected growth into full account. In states that have restructured their electric utility system, energy service companies can construct new capacity without any guarantee of a market for that electricity, which means more demand for cheaper, cleaner units such as simple cycle and combined cycle gas turbine plants. The strong economy, fueled primarily by the growth in the high technology sector, also is responsible for increased demand. Given the comparatively low capital cost of SCR, the relatively low capital cost of combined cycle power in general, and recent forecast increases for combined cycle power, requiring SCR when appropriate under BACT should not affect decisions to build new electricity generation capacity.

Conclusion

We urge EPA to withdraw and reconsider the Draft Guidance creating a presumption that BACT determinations for GE DLN combined cycle combustion turbines do not require additional NO_x emission controls, particularly SCR. While we sympathize with the underlying issues raised, albeit clumsily by the Draft Guidance regarding collateral impacts, the concerns expressed by EPA do not justify the conclusions reached, nor the action proposed. We disagree with EPA that requiring SCR for GE DLN combustion turbines will frustrate the replacement of existing fossil fuel-fired generating capacity with combined cycle combustion turbine technology in the electric generating market. This concern is misplaced, since short-term and long-term forecasts uniformly predict that advanced combined cycle natural gas turbines will capture a dramatic share of the electricity generation market.

If not withdrawn, we believe the Draft Guidance will exacerbate, not resolve "recent controversies involving state permitting agencies, utilities, and turbine manufacturers over appropriate best available control technology (BACT) controls for NOx at natural gas combined cycle turbines for electric power generation." The Draft Guidance effectively "freezes" BACT by declaring that the addition of any post-combustion control technology for DLN turbines will actually increase NO_x emissions nationwide. More generally, the Draft Guidance sets a dangerous precedent across the power generation industry, despite EPA's assertion that it applies only to DLN turbines. Based on the logic of EPA's electricity market displacement theory, any permit applicant could argue that imposing more expensive pollution control technology will cause a shift in the sequence of power dispatch. EPA's market displacement theory violates BACT, and it is wrong on the facts.

For all the reasons explained above, we urge EPA to withdraw the Draft Guidance.

Sincerely,

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Indianapolis, IN

Elliot Levinsohn
American Lung Association
of Michigan
Lansing, MI

Dennis Schvejda, Conservation Chair
NJ Chapter Sierra Club
Princeton, NJ

Vicki Deisner, Executive Director
Ohio Environmental Council
Columbus, OH

Rachel Shimshak, Executive Director
Renewable Northwest Project
Portland, OR

Ulla-Britt Reeves, Director
Clean Air Program
Southern Alliance for Clean Energy
Knoxville, TN

Karen Hadden, Clean Air Coordinator
SEED Coalition
Austin, Texas

Neil Carman, Clean Air Program Director
Sierra Club Lone Star Chapter
Austin, TX

Ron Parry, President
Galveston-Houston Association for Smog Prevention
Houston, TX

Tom "Smitty" Smith, State Director
Public Citizen
Austin, TX

Todd Main, Director
Texas Campaign for the Environment
Austin, TX

Kathy Van Dame
Wasatch Clean Air Coalition
Salt Lake City, UT

Jeff Gleason, Director

Southern Environmental Law Center
Charlottesville, VA

David Muhly, Chair
Virginia Forest Watch
Wytheville, VA

Document 16

Thank you for the opportunity to comment on the "Draft Guidance on BACT for NOx Control at Combined Cycle Turbines" included our specific comments within each document as footnotes. The Missouri footnote comments are started with "M included with the document. The following are several comments that are more general in nature.

First, Missouri is asking that the comment period be extended. There is a specific comment of this same request within t used in the guidance as justification is not generally available. Specifically, there are cites to an "IPM" modeling exercise referenced vaguely and without the modeling details, it is difficult to understand whether the results truly support their use

Missouri questions whether this "guidance" should be done as a part of rulemaking rather than promulgated as guidance. in need of updating. The update to this NSPS would be the appropriate place to bring these and other issues to light. Th more formal administrative process to answer.

This guidance presents a significant departure from the Top-Down BACT procedures that state and local agencies curren only real collateral affect analyzed was ammonia. Ammonia is currently considered by every state or local permitting auth not the only other "environmental and energy" concern. US EPA must at least present the other "environmental and ener formaldehyde). US EPA has also placed on the table for consideration electric utility grid-wide emissions affects. This is provided or presented a procedure for permitting authorities to use in these situations. US EPA must submit their propose attempting to use such a procedure as justification for control technology decisions.

The cost savings for dry low-NOx (DLN) technology when used in conjunction with selective catalytic reduction (SCR) wer requires less catalyst when used in conjunction with SCR for the same level of emissions at non-DLN sites, is a direct co on encouraging pollution prevention and improved efficiencies, you will have to consider increasing the cost to polluters. made innovative technology and pollution prevention noncompetitive.

Finally, the electric power industry has created its own crisis and is now using that energy crisis as justification to allow l (17) years have gone by without a single significant power industry construction project. That far exceeds the nominal tir needs of the area. This lack of effort on the part of this industrial sector should have been unacceptable. Now, in the mic laid at the government's environmental permitting authorities "feet" as our problem to solve. I agree that the guidance mak too one-sided and needs to be re-draft and presented again before being finaled.

Again, thank you for this opportunity.
ttfn
Randy Raymond
Missouri Air Pollution Control Program
Permit Chief
P.O. Box 176
Jefferson City, MO 65102, office: (573) 526-3835

Document 17

Department of Energy

Washington, DC 20585

September 18, 2000

Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, NC 27711

RE: Draft Guidance on BACT for NOx Control at Combined Cycle Turbines
(65FR50202; August 17, 2000)

The Department of Energy (DOE) supports the principles presented by the Environmental Protection Agency's (EPA) August 4, 2000, draft guidance to permitting agencies when establishing BACT for inherently low NOx combustion turbines used in combined cycle power systems. These principles include consideration of the ancillary environmental impacts of a technology, including system impacts. The Department's research and development program has worked with the private sector in developing inherently clean NOx combustion systems, and our success is evidenced by the commercialization of systems which reduce NOx emissions below 10 parts per million, by volume (ppmv), without the use of complex and costly add-on control systems such as selective catalytic reduction (SCR).

We share EPA's stated concern that permitting agency pressure to reduce these low emissions to even lower levels by requiring the installation of SCR could lead to both increased costs to produce electric power, and increased emissions of pollutants, including NOx. This pressure would also chill private sector interest in further environmental improvements in combustion systems. However, DOE is concerned that the rebuttable presumption approach in the draft guidance is so administratively cumbersome that it will discourage maximum deployment of advanced combined cycle power systems which are inherently low in emissions. This would have the unfortunate dual consequence of increasing both emissions and the cost of electricity.

In order to address these issues, the Department suggests two changes in the draft policy guidance.

First, separate the source category for combined cycle power systems into two groups:

- Systems powered by combustion turbines which are inherently low in NOx emissions (i.e., emit less than 10 ppmv NOx), and
- Other systems

Second, explicitly identify minimum BACT performance levels for control systems for each of the above categories. For systems meeting the criteria for inherently low emissions, minimum BACT should be defined as proper maintenance and operation of the combustion NOx control system. For other systems, minimum BACT could be defined as a small percentage of the NOx rate exiting the turbine. Alternatively, both of these performance levels could be defined in terms of emission concentration (e.g., 9 ppm or 5 ppm).

The suggested approach preserves the prerogatives of the permitting authority, while sending a clear message that the analytic burdens provided for in the draft guidance package are generally unnecessary to determine BACT for inherently low NOx technologies.

The Department believes that these simple changes in the guidance will result in lower national and regional emissions of NOx and other pollutants, as well as lower cost electricity. In addition, with these changes, the guidance will send a signal to technology developers that research on pollution prevention will be encouraged, not discouraged, by regulators.

A more detailed discussion of these points is provided in the attached staff comments.

Thank you for your consideration of these comments. Please refer any technical questions to Doug Carter (202-586-9684) or Jean Vernet (202- 586-4755).

/s/

Robert S. Kripowicz
Acting Assistant Secretary
Office of Fossil Energy

/s/

Melanie A. Kenderdine
Director
Office of Policy

Document 18

Joel Bluestein - Director 1655 North Fort Myer Drive Suite 600, Arlington, VA 22208
703-528-1900 Fax 703-528-5106

September 18, 2000

Gas Coalition Comments on Draft Guidance on Consideration of Collateral Environmental Impacts Associated with the Use of SCR at Dry Low NO_x Combined Cycle Natural Gas Turbines

The Coalition for Gas-Based Environmental Solutions is a group of natural gas producers, pipelines and local distribution companies formed to ensure that environmental regulation recognizes and rewards the environmental benefits of clean fuel and technology. The Coalition appreciates the opportunity to review and comment on this Draft Guidance.

The Coalition applauds the EPA for beginning to address the issue of pollution prevention (P2) as an alternative to add-on controls. The EPA, industry, states and environmentalists have all agreed that P2 is a preferable control approach to end-of-pipe controls. Nevertheless, the new source permitting process tends to require add-on controls regardless of how clean sources can be made. The gas turbine industry in particular has made major investments in low emissions technology only to find that add-on controls continue to be required. There are a variety of ways of addressing this issue and it is not clear that the ammonia issue is the most critical aspect of this P2 vs add-on dilemma. Some more important issues may be to ensure that low emitting sources receive appropriate credit during the BACT review process and that efficiency is included as an aspect of control. Still, we are glad that the EPA has begun to address this issue. It is important to start thinking about the regulatory approaches to promoting clean, efficient technology.

With that in mind, we must respond to some of the objections that have been raised to this proposed guidance. It has been suggested that this guidance represents a change in policy signaling a loosening of BACT. We do not see this guidance as representing any change. Consideration of collateral environmental impacts is part of BACT. There is also no "requirement" for SCR on gas turbines.

All BACT determinations are supposed to be case-by-case determinations. This guidance simply presents information that should be considered in that process. If states judge the collateral environmental impacts of SCR to be of relative significance, they can respond appropriately in their determinations. It seems unlikely that the available information will be sufficient to avoid the need for SCR in most cases. Nevertheless, this type of analysis could lead to a more complete assessment of the value of pollution prevention for power generation. The continued consideration of other aspects of the P2 vs add-on issue is the most important possible outcome of this process.

Finally, there have been objections that this guidance inappropriately promotes a specific technology. We can only say that we wish there were as much concern over this issue during the normal pursuit of BACT. It has been very common in recent BACT determinations for states and EPA regions to promote or effectively require the use of specific technologies which are offered by only one vendor or company. This has not raised any concerns with regulators or environmental groups. It seems ironic that they are objecting to the proposed guidance language on this basis.

Again, we view this as a useful, though timid step in the right direction and look forward to continued progress on this topic. We welcome any questions or comments on these thoughts.

Document 19

John S. Seitz, Director, Office of Air Quality Planning and Standards
OAQPS/ESD/CG (MD-10)
Research Triangle Park, NC 27711

SUBJECT: Comments on Draft Document: *Consideration of Collateral Environmental Impacts Associated with the Use of SCR at Dry Low NO_x Combined Cycle Natural Gas Turbines*

Dear Mr. Seitz:

Catalytica Combustion Systems Incorporated (CCSI) would like to make the following comments regarding the above subject draft guidance document.

CCSI
CCSI markets a combustion system for industrial gas turbines called Xonon that produces less than 5 ppmvd (at 15% O_2). This technology is built into the gas turbine, and is currently available on several models. The manufacturer can apply Xonon to any gas turbine model.

Comments:
1. NOx is a criteria pollutant, and the primary target for the control of ozone. It does not seem appropriate to take a large step backward in the control of NOx to accommodate some of the minor issues addressed in this document.
2. CCSI feels that the consideration of Ammonia impacts may be appropriate in making BACT determinations.
3. There are technologies other than DLN that do not use ammonia, and the Xonon technology can achieve levels similar to SCR without the need for exhaust cleanup.
4. There is only one turbine manufacturer today that can guarantee 9 ppmv NOx, and that is only offered on a few of the largest models. The rest are guaranteed at 15 to 25 ppmv. We know of no models below 70 MW available with NOx guarantees of less than 25 ppmv.
5. CCSI questions the adoption of a policy based on the capabilities of only one manufacturer.
6. If this guidance is adopted, it should be modified to consider the difference between small and large turbines.

CCSI is eager to discuss this or related issues with you. Please contact me at the location shown below.

Thank you for your consideration.

Sincerely

/s/

J. Charles Solt
Director of Regulatory affairs

CC: William T. Harnett
Lynn Hutchinson
Karen Blanchard

Catalytica Combustion Systems Inc.
8508 Journeys End Ct
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Document 20

FLORIDA ELECTRIC POWER COORDINATING GROUP, INC. (FCG)
405 REO STREET, SUITE 100 - (813) 289-5644 - FAX (813) 289-5646
TAMPA. F1.0RIDA 33609-1094

September 18, 2000

Ms. Pamela Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
US EPA Research Triangle Park, North Carolina 27711
(919) 541-0641, fax (919) 541-5509
smith.pam@epa.gov

Dear Ms. Smith:

Re: Comments for the Draft Guidance on BACT for NOx Control at Combined Cycle Turbines

The Florida Electric Power Coordinating Group, Inc. (FCG) is a nonprofit association of 36 investor-owned, municipally-owned, and cooperatively-owned electric utilities engaged in the business of providing a large majority of the electric power to the public in the State of Florida (names and addresses of the FCG members attached for your information). The FCG represents Florida's electric utilities in environmental policy and rule development proceedings affecting the utility industry in Florida.

First, the FCG would like to commend the Agency on the development of this draft guidance that appropriately clarifies the criteria to be considered in the BACT determinations. We had suggested that this clarification was appropriate in our January 201" letter to EPA's Assistant Administrator for Air and Radiation, Mr. Robert Perciasepe, and he told us in response that he had asked his staff to review the technical issues related to ammonia emissions from SCR_ We appreciate the significant time and effort his staff and others within EPA spent in developing the guidance and associated supporting documentation to clarify the extent to which collateral environmental impacts should be considered in BACT determinations.

As you may be aware, many electric utilities, non-utility generators, and independent power producers are in the process of planning, permitting and installing a significant number of new electric generation projects across the country. One utility alone has 66 GE dry low-NOx combustion turbines on order for delivery between 2000 and 2004Capital investments of this magnitude create the keen interest utilities have in the Agency's posture regarding BACT.

While the draft guidance and supporting documentation are appropriate, helpful, and strongly supported by the FCG, we offer the following suggestions to enhance and expand upon what has been proposed.

Comment #1: Applicability - In cases where BACT is Appropriate to SimPle Cycle CTs

In the draft guidance document, the focus is solely on combined cycle applications of dry low-NOx turbines- Where BACT is appropriate EPA should expand the focus of the guidance document to include simple cycle applications since the emissions associated with a simple cycle dry low-NOx turbine are similar to those of a combined cycle application.

Comment #2: Effects gf Rtguiring SCR on Combined CycJe Proiects

One of the reasons the dry low-NOx technology is chosen over others available in the marketplace is the low (<9ppm) NOx emission rates that are achievable. These units run more efficiently with the dry low-NOx: Technology then if additional controls were added increasing the fuel consumption and emissions of pollutants not controlled by the device.

FCG agrees with the companion support document, in which EPA correctly points out that the capital and O&M costs associated with installing and operating an SCR system can have a negative effect on the viability of combined cycle and simple cycle projects; that is, fewer projects will be built when SCR is required, with resultant negative impacts on national air quality.

Also note that some projects will be Constructed with limitations to avoid application of BACT. By limiting the output of the new cleaner, more efficient unit to avoid the application of SCR, older, less efficient and less clean units would be operated to compensate for the loss of generation capability on the newer unit

Comment #3: BACT Cost Differential between a regular Turbine with SCR and a D Low-NOx Turbine with SCR

FCG requests changes to address that the Draft Guidance is only applicable when the cost differentials (between a regular turbine with SCR and a dry low-NOx turbine with SCR) are less than $2000 per ton.

Additional comments in the companion support document are needed to emphasize the competitive capital and operating costs for units to be constructed must be considered.
Units with high capital costs and high operating costs cannot be economically
dispatched, so it is very unlikely the units would be constructed. New units must be able to compete with existing units to be dispatched.

BACT as defined in the CAAA is the "maximum degree of reduction" which the permitting authority, on a case-by-case basis, while evaluating energy, environmental, and economic impacts and other costs, determines is achievable. The Draft Guidance focuses on environmental factors however it is clear from the discussion included in the Guidance, that cost considerations in conformity with the statutory provision also be considered. The costs of application of SCR to dry low-NOx turbines can vary considerably and cost substantially more than a regular gas turbine with SCR. The average cost of a regular GT with SCR is $2,000 to $3,000 per ton while the projected average cost of installing SCR on a dry low-NOx turbine is $5,000 to $7,000 per ton. Recent data shows that the true cost for some dry low-NOx turbines may be as high as $12,000 per ton.

Comment #4: Authority to Use Guidance without Penalty

As we indicated in our January 20m letter, in exercising its oversight authority, at least one EPA Region had threatened to appeal a state's BACT determinations to the Environmental Appeals Board or implement its own version of BACT through the Title V process. We also undemtand that some regions have attempted enforcement actions under Section 113 of the Clean Air Act to overturn a state's BACT determination. To help ensure that the proper deference is given to states that utilize the guidance document and consider collateral environmental impacts in their BACT determinations, the FCG believes it is necessary for the guidance to clarity that EPA will not object to BACT determinations issued consistent with guidance.

Thank you for the opportunity to comment on the Draft Guidance on BACT for NOx Control at Combined Cycle Turbines. If you have any questions, please contact me at (813) 963-0994.

Sincerely

Mike Opalinski, Chair
FCG Environmental Committee

Document 21

Pamela F. Faggert
Vice President and Chief Environmental Officer
Dominion 5000 Dominion Boulevard, Glen Allen VA 23060
Phone: 804-273-3467

September 18, 2000

Ms. Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
United States Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Re: Comments on Draft Guidance for NOx Control at Combined Cycle Units

Dear Ms. Smith:

Dominion is pleased to provide the following comments on the United States Environmental Protection Agency's (EPA) "Guidance for BACT for NO% Control at Combined Cycle Turbines." Dominion is the nation's largest fully integrated natural gas and electric utility company, We currently operate and are planning construction of several large combined cycle combustion turbines.

We fully support EPA's efforts to develop guidance that promotes and enhances each state's ability to make case-by-case best available control technology (BACT) determinations. We believe that EPA takes a major stop in the right direction with this guidance; away from the dictation of specific control technologies and towards more flexible and local ity-specific control technology determinations.

Dominion's subsidiary, Virginia Electric and Power Company, is a member of the Utility Air Regulatory Group (UARG). We support UARG's comments.

We would like to highlight one aspect of the UARG comments: that EPA clarify that there is nothing "magic" about an emission rate of 9 ppm of oxides of nitrogen (NOX) for units using dry low NOx combustion systems. As noted by UARG, the BACT determination is by definition case-by-case.

We appreciate this opportunity to comment on EPA's draft guidance. If you have any questions regarding this submittal, please contact Andy Gates of our Environmental Policy and Compliance Department at 804-273-2950.

Very truly yours,

/s/

P. F. Faggert

Document 22

GOAL LINE
ENVIRONMENTAL TECHNOLOGIES

September 18, 2000

Ms. Pamela Smith Information Transfer and Program Integration Division (MD- 12) Office of Air Quality Planning and Standards United States Environmental Protection Agency Research Triangle Park, N.C. 27711

Re: Draft Guidance on BACT for NOx Control on Certain Combined Cycle Combustion Turbine

Goal Line Environmental Technologies is an emerging world leader in breakthrough catalytic technologies for the control of air pollution from combustion sources. Since 1992, Goal Line has pioneered the development and production of molecular-scale nanophase catalyst and sorbent composites. This research has resulted in twelve patented technologies that control air pollution emitted from gas turbines, industrial facilities and internal combustion engines. One of the hallmark aspects of the SCONOx technology is that it does not use ammoruia in the control of air pollution. SCONOx is commercially available from two companies, Goal Line and Alstorn Power, Goal Line has licensed its BACT/LAER-setting SCONOx technology to Alstom Power for exclusive application on gas turbines larger in size than 100 MW. For gas turbines smaller in size than 100 MW, SCONOx is available from both Goal Line and Alstom, Goal Line appreciates the opportunity to offer comments on the draft guidance referenced above.

Requiring new and modified sources to install state-of-the-art emission controls is one of the fundamental elements of the New Source Review ("NSR") program, providing incentives for the development of new emission control technologies. In our view the draft guidance would abandon this keystone of the Act and undercut the incentive for innovation in the curTent program, The bases given for this startling departure in policy are unconvincing. Goal Line Environmental Technology ("Goal Line") urges EPA to reconsider the draft guidance.

A. False Dilemma: Less NOx vs. Less Ammonia

Because an SCR unit reduces NOx by injecting amrnonia into the gas stream, EPA says, 5-10 Pprn of ammonia "slip" would be added to the atmosphere in order to make 5.5 pprn reductions in NOx emissions from a GE "DLN" combustion turbine. This situation, the draft guidance suggests, triggers the "collateral environmental impacts" doctrine under the In re: When uncontrolled NOx emissions are that close to what can be achieved with SCR, the impacts of using SCR become an appropriate subject of analysis as part of determining BACV)l

Goal Line agrees with EPA's catalogue of concerris about the health and environmental effects of ammonia, but could not disagree more with the false dilenima EPA poses. A choice between less NOx or less ammonia is unnecessary, because NOx emission control technologies that do not use ammonia, such as Goal Line's SCONOx, are available and affordable.

EPA catalogues the important negative environmental effects of ammonia emissions: contributing to fine particulate pollution, acidifying soils and waters, contributing global warming, creating safety problems and waste issues. And ammonia slip increases disproportionately as SCR units are pushed to achieve lower NOx emission levels. Concern about the health and environmental effects of ammonia slip has led two States, Massachusetts and Rhode Island, to establish BACT limits on ammonia slip of 2.0 ppm and to require ammonia continuous emission monitors on any power plant permitted with SCR. Massachusetts has required one new unit to install zero ammonia technology.

Ammonia slip in an SCR unit also increases as the catalyst ages, because SCR units cannot regenerate catalyst during operation. The Executive Director of the California Air Resources Board has expressed concern that "compliance with ammonia limits is more difficult [for SCR) as catalyst ages,"

For exactly these reasons, Goal Line has repeatedly suggested to EPA regional offices that the collateral environmental impacts of ammonia used in SCR require BACT and LAER determinations for new gas turbines to consider ammonia-free technologies such as SCONOx. Less than a year ago, Goal Line appealed a BACT decision to the EPA EAB on the grounds that that BACT decisions must consider SCONOx under the collateral impacts doctrine cited by EPA because of the ammonia and greater conventional pollutant emissions of SCR. This view is supported by North County Resource Recovery Associates., PSD Appeal No. 85-2 (EPA, June 3, 1986) in addition to the Kawaihae decision note previously. Consideration of SCONOx is also required by EPA's NSR Workshop Manual, which mandates that States consider emissions of other pollutants as part of a collateral impact analysis.2

B. Availability of SCONOx

While OAQPS appears unaware of it, 3 EPA regional offices have concluded that SCONOx should be considered an available technology for purposes of BACT/LAER

1 Draft Guidance at 2,
2 EPA NSR Workshop Manual at B.46.
3 The draft guidance merely states that "New technologies that may eventually replare SCR are already becoming available. . .."

determinations on new combustion turbines. Region IX issued a determination in 1997 that "SCONOx has met EPA criteria as a pollution control technology which has been 'demonstrated in practice'" at 3.5 ppm at the Federal combined cycle gas turbine facility in southern California.4 A year later, the Region revised this determination down to 2.0 ppm. Consequently, the Region said, "permitting authorities planning to issue permits for future combined cycle gas turbine systems firing exclusively on natural gas, and subject to LAER, must recognize this
limit" [5]

Performance at the Federal facility has continued to improve since then. In 1999 and 2000, SCONOx has achieved sustained NOx emission levels consistently below 1.3 ppm during commercial "merchant" operatiOD6. At the same time the SCONOx unit also met a CO limit of I ppm, while virtually eliminating SOx, formaldehyde, and acetaldehyde, and making substantial reductions of VOC's and particulates compared to all other emission reduction alternatives. The Federal plant now has a history of more that 21,000 hours of commercial operation using SCONOx. Since 1997, the SCONOx unit has a reliability of more than 99%.

Region I has also recognized SCONOx, In a letter sent December 20, 1999, to the chief environmental executive of each of the States in Region 1, Regional Administrator John DeVillars stated that -

"[T1he Region now considers SCONOx a technically feasible and commercially available air pollution contiol technology that is expected to obtain emission levels for criteria pollutants such as NOx, CO, and VOC comparable or superior to previously-applied technologies for large combined cycle turbine applications, Consequently, we expect that henceforth your state will require a full evaluation of SCONOx as part of any BACT analysis for a large combined cycle power generating facility seeking a permit."

EPA seems to have recognized the concern about ammonia, but in the draft guidance missed the obvious conclusion. Concerns about ammonia do not require accepting higher emissions of NOx: to the contrary, they dictate consideration of alternative emission control technologies that do not use ammonia to reduce NOx emissions.

C. The Life Cycle Cost of SCONOx Is About the Same as That of SCR

Over a ten year life cycle, SCONOx is about the same in cost as SCR on a capital and O&M basis. Attached is an analysis comparing SCONOx with SCR on a GE Frame 7FA controlling NOx from 9 pprn to 2 ppm on a tem-year lifecycle basis. This analysis is based upon EPA's standard BACT calculations. We note that SCONOx warranted catalyst performance is 7 years compared to SCR wazranted performance of only 3 years. As a result, the SCR catalyst bed will need to be replaced 3 times during a I 0-year period, while the SCONOx catalyst bed will need to be replaced only once. For a twenty-year lifecycle, more realistic in terms of actual lifetime of turbine and emission control

system performance, SCONOx is less expensive than SCR. During twenty years, the SCONOx catalyst will need to be replaced twice while SCR catalyst will need to be replaced six times.

4 Letter to Robert Danziger from Matt Haber, Chief, Permits Office, Air Division, U.S. EPA Region IX (July2, 1997).
5 Letter to Robert Danziger ftom Matt Haber, Chief, Permits Office, Air Division, U.S. EPA Region IX (March 23, 1998).
6 Letter to Shasta County Air Pollution Control District from Matt Haber, Chief, Permits Office, Air Division, U.S. UA R,;A!.n U%`(F,~bruary 4, 2000) and Letter to all California air pollution control districts and air quality management districts from Matt Haber, Chief, Permits Office, Air Division, U.S. EPA Region IX (April 4, 2000).

It is important to note also that Goal Line offers a rebate on catalyst pricing for recycling to recover precious metals such as platinum. SCR catalyst on the other hand, degrades over time and requiTeS special disposal since it uses vanadium.

D. Effect on Overall NOx Emissions

We disagree also with EPA's second line of argument for exempting GE DLN combustion turbines from installing NOx emissions control technology. This argument is, the Agency admits, "counter-intuitive:"

"The effect of requiring SCR or other add-on NOx controls on these turbines may be to increase rather than decrease NOx emissions." [P. 5]

This projection is based on a reductionist application of economic theory - that if regulation increases the cost of new gas-fired units even slightly, fewer will be built. With fewer new gas units being built, more electricity will be generated by higher emitting coal-fired units, thus increasing national NOx emissions, according to the theory.

While this is a fine argument in theory, it has little to do with the real world. In the real world the supply of electricity is extremely tight, as can be seen most clearly in California. New gas-fircd units are additions to capacity, not replaceinents for existing coal-fired generation. If gas turbines are cheaper, they will not replace coal-fired units, because both are needed to meet demand. Indeed, over the past several years, capacity factors for existing coal-fired power plants have increased steadily to meet increasing demand-Nor is it likely that control technologies on gas turbines will affect their dispatch as compared to coal-fired units. During time periods when demand for electricity is below peak, the dispatch order for coal- and gas-fired units depends primarily on the relative price of the two fuels. That is admitted in a report provided to EPA by General Electric, which describes natural gas price assumptions as "the most significant variable analyzed." In other words, the cost of emission controls on gas-fired plants would throw the dispatch order towards coal only in the rare circumstance when the prices of the two fuels were essentially the same.

E. Implications of the Draft Guidance for National Clean Air Policy

We am particularly distxessed at the implications of the draft guidance for national New Source Review ("NSR") policy.

Requiring installation of state-of-the-art emission control technology on major new (or modified) emission sources is a cornerstone of the NSR prograrn and the Clean Air Act. A new or modified source in a non-attainment area must meet the "lowest achievable emission rate" ("LAER")7, "the most stringent emission limitation which is contained in the implementation plan of any State for such class or category of source" or "the most stringent emission limitation which is achieved in practice by such class or category of source." 8 New sources in an attainment area must install "best available control technology" ("BACT").9

For years various interest groups have argued that the policy of the Act was irrational, because it would be More cost-effective to make reductions from high-emining old units. EPA has steadfastly defended the policy of the law throughout eight-yeax negotiations over amending the NSR regulations. It seems strange indeed, then, that on the eve of announcing proposed revisions to the NSR policy, the Agency would abandon the principle of state-of-the-art controls on new sources in a guidance document.

In our view the guidance puts EPA on a slippery slope leading to the destruction of the state-of-the-art controls principle. The economic argument that EPA has made can be used by the proponent of practically any new source. If the draft guidance becomesfinal, we expect that before long other manufacturers of combustion turbines will use the same arguments, plus the argument of equity to escape state-of-the-art technology requirements. In the fastest-growing segment of the largest-emitting sector of our economy, this would be very troubling.

Sincerely,

/s/

Allan F. Bedwell Vice President

Attachment: SCONOx & SCR Cost Comparison

7 Clean Air Act, § 173(a)(2). 8 Cle&n Air Act, § 171(4). 9 Ckan Air Act, § 165(a)(4).

Document 23

Pamela J. Smith
Information Transfer and Program Integration Division
MD-12
Office of Air Quality Planning and Standards
U. S. EPA
Research Triangle Park, North Carolina 27711

September 18, 2000

Re: Draft Guidance on BACT for NOx Control at Combined Cycle Turbines

Dear Ms. Smith:

The Massachusetts Department of Environmental Protection (DEP), Bureau of Waste Prevention offers the following comments on EPA's Draft Guidance.

In the last 18 months, DEP has issued permits to five new combined cycle power plants (11 combustion turbines) that will produce 3860 MW of clean power. The LAER (4) and BACT (1) determinations resulted in emission limitations of 2 ppm NOx and 2 ppm NH3 (2&2) for all these projects by use of selective catalytic reduction (SCR). Currently, three additional new power projects (1545 MW total - 5 combustion turbines) are nearing final permit review with all proposed to meet 2&2. Another project (1100 MW) is in initial review and will be required to at least meet 2&2. This project will net out of non-attainment review and be subject to BACT. For over 6500 MW of new power generation being permitted in Massachusetts, DEP has found no distinction between BACT and LAER determinations for combined cycle power plants. It should be noted that the projects have annualized costs of approximately $1000 per ton of NOx controlled.

DEP is concerned that EPA's proposal would allow BACT to be set at 9 ppm NOx based upon an individual manufacturer's combustion turbine that incorporates dry low NOx. There are two technologies (SCONOX & XONON) that hold promise of very low NOx emissions without the emissions of NH3 from SCR control systems. EPA's position will impede further development of these promising technologies. The lower emission levels resulting from SCR systems provides the technology forcing aspect intended by the BACT process to further develop pollution prevention technologies. Without this, further innovation will be stymied and turbine manufactures' will be content to "just meet 9".

Massachusetts is downwind from areas of the country where there are significant power needs. Given that we are the beneficiaries of control actions taken upwind, we ask EPA to ensure that the level of

control reflects that which is readily achievable. DEP believes that at this time BACT determinations in attainment areas should result in emissions of at least 2&2.

That levels are technically and economically achievable is borne out by the number of actual projects currently approved and under construction in Massachusetts.

The effect of EPA's draft guidance will be to relax emission requirements. These new natural gas combined cycle power plants will operate many years into the future. It is critical that environmental regulatory agencies require the most stringent requirements to protect and enhance our air resources for public health and a clean environment.

If you have questions on this issue, please contact Mr. Robert Donaldson of my staff at (617) 292-5619.

Sincerely,

/s/

James C. Colman
Assistant Commissioner
Bureau of Waste Prevention

Document 24

Dear Ms. Smith,

I am writing to provide comment on the draft memorandum titled "Consideration of Collateral Environmental Impacts Asso
Natural Gas Turbines." As a Sierra Club employee who has worked on permits, many of which involve questions about B
the implications of this draft memorandum, which I believe does serious damage to the Prevention of Significant Deteriorat
for the use of BACT.

1. Although the language of the memorandum seems to say the decision against SCR as BACT must not be taken lightly
the rejection of SCR as BACT for all DLN
turbines. Consideration of collateral impacts has, I believe, always allowed under BACT. The burden of proving those im
otherwise would be BACT, however, has been high - as it should be. The policy of requiring BACT is the cornerstone of
of proof.

The draft memorandum, however, will have the effect of shifting the burden. The implementing agencies are in my experie
in enforcing the full rigor of BACT. An EPA memorandum that will support a weaker limitation, combined with the usual p
discretion, will make it nearly impossible for a citizen to successfully challenge a decision to reject SCR as BACT.

But, even were the implementing agency willing to require SCR as BACT, this memorandum will be used by industry to ap
memorandum easily lends itself to be used as a tool with which industry can bring political pressure on a permitting agen
this
memorandum?

This memorandum should be withdrawn as it is unnecessary for the consideration of collateral impacts; creates an unfair
and it provides industry with a ready made set of arguments to use as leverage to get a project approved without SCR.

2. The draft memorandum allows consideration of the possibility that the requirement for SCR may cause more power to
inappropriate and, furthermore, is a serious threat to very foundation of BACT. While other arguments found in the memo
cannot be so narrowly confined and will, I believe, seriously erode BACT. The basic argument seems to be that a cance
dirtier plants more attractive. This train of thought regarding sector wide impacts is followed only so far as to form a basis
ways the rejection of SCR may impact the environment. For instance, how will it effect research, development, and availa
patterns of development if one state is more willing to reject SCR than another.

And, once this chain of logic is adopted, there is absolutely no way to avoid its application in other sectors. How can EP
consideration for combined cycle turbines, but not for steel mini-mills.

I would readily agree that EPA needs a more comprehensive policy toward the control of air pollution from electric power
emphasis in BACT in on application of specific technology to specific facilities, not as a tool for minimizing impacts over a
the means of achieving it.

Thank you for this opportunity to provide comment.

Sincerely,
/s/
Glenn Landers
Sierra Club Cleveland Office
2460 Fairmount Blvd., Suite C

Cleveland Heights, Ohio 44106

ph: 216-791-9110
fax: 216-791-9138

glenn.landers@sierraclub.org

Document 25

September 18, 2000

Ms. Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, NC 27711

Dear Ms. Smith:

On behalf of the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO), thank you for the opportunity to comment on the U.S. Environmental Protection Agency's (EPA's) August 17, 2000 draft *Guidance on Best Available Control Technology (BACT) for NO_x Control at Combined Cycle Turbines* (65 FR 50202). Specifically, the subject of the draft guidance is a consideration of collateral environmental impacts associated with the use of selective catalytic reduction (SCR) as BACT for NO_x on dry low-NO_x equipped natural gas-fired combined cycle turbines.

While, theoretically, the associations do not disagree with the identification and discussion of potential collateral impacts from the application of SCR technology, we are unclear why EPA is proposing this specific draft guidance and we have serious concerns with the document as written. First and foremost, we are concerned that the draft guidance sets a presumptive BACT of 9 ppm NO_x for gas-fired combined-cycle turbines that seriously undermines state and local agencies efforts to require more stringent BACT requirements. State and local air agencies are in the best position to determine what level of control is BACT considering a number of factors, including impact on local air quality. We do not understand why the Agency would issue guidance that seriously compromises the ability of state and local agencies to make appropriate BACT determinations.

Moreover, state and local agencies have formally endorsed EPA's top-down BACT process. We believe that EPA's top-down BACT process is the most effective way to assure the best controls on sources at the time of installation or modification. Use of this process allows for consideration of the issues raised by EPA in its draft guidance document, but leaves the final BACT determination at the state of local level, where such determination properly belongs. We believe that issuance of the guidance as drafted will undermine the top-down BACT process and introduce into the market place the presumption that a 9 ppm NO_x for gas-fired combined-cycle turbines is BACT.

Furthermore, by setting a presumptive BACT, the guidance effectively removes any incentive for industry to develop and install controls more stringent than the presumptive BACT. The 30-year history of technology development under the Clean Air Act and the New Source Review rules clearly demonstrates that regulations drive technological innovation. By removing such regulatory incentives, this guidance seriously undermines future technological improvements in the area of pollution control. Moreover, by raising the emissions levels approved as BACT, the draft guidance essentially defines BACT for those units achieving 9 ppm as requiring no additional controls. We believe this sets an unwarranted precedent for other technology-based determinations such as MACT and LAER.

Finally, we are concerned with the emphasis the draft guidance places on ammonia. While we recognize that it is appropriate to consider the impacts of other pollutants, such as ammonia, in BACT determinations, we believe that the guidance overestimates the impact of potential ammonia emissions from a source that employs Selective Catalytic Reduction (SCR) as a NOx control strategy. The NOx emissions generated by ammonia slippage from use of SCR are overstated in the document and are minimal as compared to ammonia emissions from other sources, such as hog farms and other agribusinesses. If EPA is seriously concerned about emissions of ammonia to the environment, it should address these larger sources first. Moreover, the guidance ignores other toxics generated by the gas turbine process that pose a much greater threat to public health and the environment. We believe that the issue regarding ammonia usage and emissions can be addressed through the current top-down BACT process.

Again, thank you for the opportunity to comment, however, for all of the above stated reasons, we strongly recommend that the Agency refrain from issuing this guidance document.

If you have any further questions or desire additional information, please contact either of us or S. William Becker of STAPPA and ALAPCO.

Sincerely,

John Paul
ALAPCO Chair
NSR Committee

Bill O'Sullivan
STAPPA Chair
NSR Committee

Cc: Bill Harnett
Ellen

Document 26

September 18, 2000

N3615 (2350)

Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Dear Ms. Smith:

On behalf of the National Park Service (NPS) and the U.S. Fish and Wildlife Service (FWS), we would like to thank EPA for the opportunity to comment on the draft Selective Catalytic Reduction (SCR) guidance. We believe that this is an important topic for the protection and preservation of the Air Quality Related Values of our trust lands. The NPS and FWS would like to support EPA in ensuring that all aspects of SCR are evaluated to ensure that our trust lands are protected into the future.

There are five areas of the draft SCR guidance on which NPS and FWS are providing comments: 1) The NO_x emission reductions that can be achieved with SCR; 2) the ammonia slip from SCR; 3) the concern that dirtier plants will increase operation if SCR is required on combined cycle turbines employing Dry Low NO_x (DLN); 4) the contributions of ammonium ion, nitrate, and nitric acid deposition on acidification, fertilization and eutrophication; and 5) the advantages of reducing NO_x in ozone-sensitive areas.

NO_x Emission Reductions

The background section of the draft SCR guidance states that SCR can reduce NO_x emissions from turbines to 2.5ppm to 4.5ppm with an ammonia slip of 5ppm to 10ppm. NPS and FWS believe that several issues need to be clarified for NO_x reductions achievable with SCR. The NPS and FWS have seen NO_x permitted in the range of 2ppm to 3.5ppm when SCR is applied to a turbine already employing DLN. While this is a small change in ppm, the overall impact can be considerable when applied to large facilities. In a recent permit pre-application for a 1,600 MW natural gas fired, combined cycle turbine, reducing NO_x emissions from 3.5ppm to 2.5ppm resulted in a reduction of 223 tons of NO_x per year. The NPS and FWS believe it is very important to employ the principles of BACT when the achievable emission reductions are considered in a BACT evaluation. Under this philosophy, we recommend that EPA use the lower emission limits of 2 to 3.5ppm in the draft SCR guidance.

Ammonia Slip

NPS and FWS also believe that the ammonia slip issue should be further explained. Vendors at a recent NO_x control technology seminar in Dallas specified that the ammonia slip is not constant over the life of the catalyst. A 5ppm guarantee would break down into 1 to 2ppm ammonia slip over the first four years of operation and increase to 4 to 5ppm after six years of catalyst life. This provides a much lower ammonia emission level over the life of the catalyst than a flat 5ppm assumption would indicate. Additionally, the NPS and FWS believe that, because a 5ppm slip has been attained by other sources, a source asking for a 10ppm slip would need to address the technical and economic differences between the source asking for 10ppm and those that have achieved 5ppm. This is supported by the EPA NSR Workshop manual which states "Where a control technology has been successfully applied to a similar source in a source category, an applicant should concentrate on documenting significant cost differences, if any, between the application of the control technology on those other sources and the particular source under review."[1] SCR becomes more favorable when realistic NO_x emission rates (2-3.5ppm) and ammonia slip rates (1-2ppm for the first 4 years and 5ppm until the catalyst is changed) are assumed in the BACT analysis. NPS and FWS do recognize that, at some point, if DLN achieves low enough NO_x levels, SCR will become economically infeasible. However, we believe that sources need to use BACT levels for NO_x emissions and realistic ammonia slip values for the feasibility calculations.

Increased Usage of Dirtier Plants

EPA also brings up the issue that "if SCR is required on a new DLN turbine, the added capital and operating costs of SCR may mean that more electricity will be produced by dirtier plants." We continue to see States permit new combined cycle plants, and this indicates that the current base is inadequate to meet demands. We believe that the "brown outs" and power failures that have occurred across the country over the past few years further support this assumption. Based on these observations, the dirty base load plants will likely continue to operate to meet the power demand and, in order to protect our areas, we need to ensure that new sources are as clean as possible. (We question EPA's assertion and request documentation that "new natural gas combined cycle plants produce electricity more cheaply than many older steam generating units.") If the dirtier plants are a significant concern, EPA might consider requiring additional controls on these older and dirtier sources. For example, the level of control represented by the NO_x SIP Call is only 62% and required only during the ozone season. If SCR were applied and used to the fullest extent of its capabilities, annual NO_x reductions would almost double. Not only would full utilization of SCR result in significant NO_x reductions year-round, it would also tend to level the playing field with respect to cleaner gas-fired generators.

Acidification, Fertilization, Eutrophication

The guidance discusses the contributions of ammonium ion, nitrate, and nitric acid deposition to acidification, fertilization, and eutrophication of ecosystems. EPA notes that ecosystems differ in their responses to ammonium, nitrate, and nitric acid, and these differences must be taken into account when evaluating the relative ecological benefits of SCR versus DLN control. The disadvantages of SCR (i.e., ammonia slip) should be weighed against its advantages (i.e., reduction in NO_x emissions).

The FWS and NPS believe that for many ecosystems, the reductions achieved by SCR, despite some ammonia slip, produce a clear ecological benefit over dry low NO_x control. For example, in coastal and estuarine ecosystems that are susceptible to nitrogen-induced eutrophication, a net reduction in total nitrogen deposition is desirable. As we note above, the nitrogen reductions that can be achieved by SCR are expected to significantly exceed the small nitrogen increases produced by ammonia slip. Decreases in total nitrogen deposition will benefit a number of FWS and NPS coastal areas, including Chassahowitzka Wilderness and Everglades National Park.

Terrestrial ecosystems are fertilized by nitrogen deposition. In wildland areas, including many FWS and NPS areas, this is considered an unwonted effect that may cause changes in nutrient cycling and in species composition and diversity. In general, control strategies, including SCR, that limit total nitrogen deposition are preferred.

However, for ecosystems vulnerable to episodic or chronic acidification, the advantages of SCR will have to be determined on a case-by-case basis. For certain areas, including those that experience episodic acidification following snowmelt, limiting ammonia emissions may be an important consideration. The Federal Land Manager (FLM) can provide guidance to the permit applicant and State on the relative advantages to such ecosystems of limiting NO_x emissions versus ammonia emissions.

Ozone

We agree with EPA, that in areas where ozone is a concern, SCR should be chosen over DLN only in order to avoid aggravating the ozone problem in the area. We believe that this is especially important for sources being constructed near parks and refuges that have documented ozone problems.

Conclusions

NPS and FWS support EPA in providing the FLMs, States, and sources with guidelines in determining the overall environmental impact of emission reduction technologies. We believe that guidance can help ensure that the technology employed does not have an overall adverse impact on the environment. However, we believe it is vital to ensure that the guidance provided continues to employ the BACT principles to ensure that the best technology is employed and an accurate analysis is done. In summary we believe that: 1) EPA has underestimated SCR effectiveness; 2) EPA has overestimated ammonia slip; 3) EPA has overstated the likelihood that dirty old plants will be used instead of SCR-controlled new sources; 4) except for ecosystems where chronic acidification is a concern, the benefits of SCR usually outweigh the problems of ammonia slip, and even where acidification is a concern, a case-by-case evaluation must be made; and 5) NO_x reduction is clearly beneficial in ozone-sensitive areas.

Sincerely,

John Bunyak
Chief, Policy, Planning and Permit Review Branch
National Park Service

Sandra Silva
Chief, Air Quality Branch
U.S. Fish and Wildlife Service

cc: STAPPA/ALAPCO
NPCA
EDF

New Source Review Workshop Manual, EPA, 1990, p. B.31

Document 27

Electronically submitted comments of the
Regional Air Pollution Control Agency
451 W. Third Street
Dayton, Ohio 45422

September 18, 2000

Ms. Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, NC 27711

Dear Ms. Smith:

Staff of the Regional Air Pollution Control Agency (RAPCA) have reviewed EPA's proposed guidance document titled, "Consideration of Collateral Environmental Impacts Associated With the Use of SCR at Dry Low NOx Combined Cycle Natural Gas Turbines." The availability of this guidance was announced in the Federal Register, with a request for comments, on August 17, 2000 (65 FR 50202).

RAPCA staff strongly urge EPA not to issue the guidance as drafted. We feel the guidance, whether intended or not, leaves a very strong presumption that 9 ppm of NOx emissions is BACT for new combined cycle gas-fired turbines. Since this level is achievable without the addition of SCR, the guidance would seriously jeopardize state and local agency efforts to require NOx emission levels in the range of 2-4 ppm. Such a presumption in EPA official guidance would seriously undermine a state or local determination that a lower level of NOx emissions are appropriate as BACT.

RAPCA uses EPA's top-down process for determining BACT on new sources. This process allows for consideration of the issues raised in the guidance document which is the subject of these comments. However, it does so without the presumptions built into EPA's document. We do not feel ammonia slip is as troublesome as EPA's document portrayal. Our significant sources of ammonia (hog farms) are currently unregulated from an air pollution standpoint in Ohio and should be addressed prior to any serious consideration given to the relatively minor ammonia emissions which would be generated through use of SCR. We assume this should apply elsewhere in the US. However, we consider the safety issues surrounding ammonia transport, storage, and use to be of greater concern that EPA's document suggests, and would consider such issues in a BACT determination. Proper use of the top-down BACT process allows for consideration, in the public forum, of all issues, without any presumption of BACT levels.

Thank you for this opportunity to comment on the draft document. We appreciate EPA's efforts to help state and local agencies determine BACT levels for NOx emissions from gas turbines. There are a large number of turbine installations ongoing in the US today. However, we feel the current top-down BACT process allows for the consideration of the issues raised in the guidance document without the dangerous presumption that 9 ppm NOx is BACT. Therefore, we urge EPA to withhold the draft guidance.
Sincerely,
/s/
John A. Paul, Supervisor

Document 28

GE comments are in a separate file.

Document 29

Duke Energy Corporation
Corporate Environment,
Health & Safety
EC12ZA
P.O. Box 1006
Charlotte, NC 28201-1006

526 South Church Street
Charlotte, NC 28202-1802
(704) 373 - 6410

September 18, 2000

Ms. Ellen Brown
Information Transfer and Program
Integration Division (MD-12)
Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park North Carolina 27711

Re: Comments on Draft Guidance for NOx Control at Combined Cycle Units

Dear Ms. Brown:

Duke Energy Corporation ("Duke Energy") is filing these comments in response to EPA's request for comments in 65 Fed. Reg. 50202 (August 17, 200) concerning the Agency's draft best available control technology (BACT) guidance for NOx Control at Combined Cycle Units. Duke Energy is a member of the Utility Air Regulatory Group (UARG) and also supports the comments filed by UARG on this issue.

Duke Energy is an investor owned world wide energy company. Duke Energy operates three nuclear generating stations, eight coal-fired stations, and numerous hydroelectric stations in the two Carolinas. Duke Energy also owns, operates and develops natural gas fired generating facilities, including natural gas fired combined cycle units, throughout the U.S. Duke Energy owns and operates an interstate natural gas pipeline network and is involved in natural gas gathering and processing, energy trading and marketing, and in the development of energy facilities worldwide.

In general, Duke Energy supports EPA's draft guidance. Duke Energy believes that state permit writers should have a great deal of flexibility in determining BACT. The Clean Air Act as well as EPA's

regulations make it abundantly clear that a BACT determination must be based upon a case-by-case, site specific balancing of energy, environmental, and economic impacts and other cost, and mandate that this balancing be done by the appropriate State permitting authority.

Duke Energy supports EPA's draft guidance because is assures state permit writers that they have the authority to implement the statutory and regulatory criteria - energy, environmental and economic impacts and other costs - in making BACT determinations. We believe the guidance should clarify that state permit writers have authority to consider the incremental costs and benefits of requiring selective catalytic reduction technology to futher reduct Nox emissions. We agree with EPA that those "energy, environmental and economic impacts and other costs" include the effect of ammonia slip on the formation of fine particles and visibility, the effect of acidifying deposition on soils and water bodies, the possibility of nitrogen deposition causing euthrophication of water bodies, issues related to ammonia safety and the costs and environmental problems associated with the disposal of spent catalyst materials. We also believe that these criteria allow state permit writers to consider other relevant factors that EPA did not discuss in its draft document, such as efficiency penalties.

The draft guidance should clarify that there is nothing "magic" in the Act or EPA's regulations about a 9 ppm emission rate at a dry low Nox combustor. For example, many combined cycle units include supplemental firing (e.g., duct burners) that will have a slightly higher emission rate. There is no reason that this analysis would not apply to such units, and the guidance should clarify this point. The results of any analysis must be case-by-case, and neither the Clean Air Act nor EPA's rules allow EPA to dictate in the abstract the results of such an analysis.

There is no reason why EPA's guidance should not apply to simple cycle peaking combustion turbines as well. Duke Energy recommends that the scope of the guidance be expanded to include simple cycle turbines.

Duke Energy appreciates the opportunity to comment on EPA's draft guidance.

Sincerely,

/s/

Michael W. Stroben
Manager
Corporate EHS Technical Analysis

cc: Ken Johnson
Garry Rice
Robert Mc Murry

Document 30

September 18, 2000

Via E-mail (smith.pam@epa.gov) and Overnight Delivery

Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, North Carolina 27711

Re: Draft Guidance on BACT for NOx Control at Combined Cycle Turbines
Comments of PSEG

Dear Ms. Smith:

Public Service Enterprise Group Incorporated (PSEG) is pleased to submit comments on the draft guidance issued by the United States Environmental Protection Agency (EPA) regarding best available control technology (BACT) requirements for control of NOx emissions from combined-cycle turbines using dry low-NOx (DLN) combustors.

The guidance is intended to assist permit authorities in determining whether a combined-cycle unit with DLN must be equipped with selective catalytic reduction (SCR) to satisfy BACT requirements for the control of NOx in attainment areas. PSEG agrees that guidance from the EPA would be helpful on this issue. In our experience, different state permit authorities reach different conclusions about whether the addition of SCR is required to satisfy BACT for gas turbines equipped with DLN. The different conclusions cannot always be attributed to circumstances that are unique to the proposed unit, to unique aspects of the location proposed for its construction, or to differences in the cost-effectiveness of SCR for different proposed units.

This inconsistency is especially problematic as the electric utility industry is becoming deregulated. The spread of deregulation puts each electric generating unit into competition with other units in an expanding area. Each unit must compete not only with other units in the same state, but also with units located across entire regions and in other regions as well. The draft guidance recognizes that if two competing DLN combined-cycle units are built in different states, and only one of the states has concluded that BACT requires SCR, the unit without SCR will have lesser capital and operating costs and will tend to operate more than the unit with SCR. Inconsistent BACT determinations could therefore change the competitive balance and tend to increase generation of electricity in the states with less stringent approaches to BACT.

Each BACT determination is necessarily a case-by-case evaluation of circumstances particular to each project. However, we should strive to avoid inconsistent application of BACT requirements resulting from different interpretations of the relevant law and regulations, and inconsistencies when the relevant circumstances are essentially similar. We commend the EPA for making the effort to provide guidance to eliminate these

inconsistencies.

Unfortunately, the draft guidance in its current form risks preserving those inconsistencies. For example, with respect to ground-level ozone, the draft guidance lists "some important factors to consider in weighing the potential ozone impacts." The draft guidance takes the same "list of factors" approach to fine particulates, acid deposition, and nitrogen deposition and eutrophication. For each factor, the draft guidance is silent about all of the following:

- Threshold levels for each factor (for example, how close a proposed project could be to a Class I area without that proximity making SCR mandatory);
- How the factors relate to one another (for example, how close a project could be to a Class I area without that proximity making SCR mandatory, if meteorological phenomena would exacerbate the contribution of the source to ozone formation downwind);
- How the cost-effectiveness of SCR is to be considered; and
- How to weigh the factors, and reach a decision when application of some factors favor SCR while application of other factors does not.

We recognize that no single guidance document could be comprehensive enough to cover all of the possible combinations of circumstances addressed by all of the factors. The number of possible combinations is countless, and it is difficult if not impossible to set appropriate threshold levels for any factor. For example, we would not expect to see guidance stating that any proposed unit with the potential to emit 300 tons of NOx per year must be equipped with SCR if the unit is located within 12 miles of a Class I area.

The problem is that a simple list of factors gives no little or no help to a permitting authority attempting to apply the guidance to evaluate the particular combination of circumstances it has before it in a given case. The end result will be inconsistent determinations among agencies. Each permitting authority will in effect use the factors not to guide the making of its BACT determination, but only to explain it after the fact.

For these reasons, we request that the EPA revise the draft guidance so that it will better serve the goal of helping permitting authorities take a consistent approach to BACT determinations for gas turbines with DLN combustors.

Thank you for providing us with this opportunity to comment on the draft guidance. Please call me at 973 430-3709 if you need any additional information or if you would like to discuss this further.

Very truly yours,

/S/

Samuel A. Wolfe
Environmental Policy Manager

Document 31

September 18, 2000

Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, NC 27711

RE: Draft Guidance on BACT for NOx Control at Combined Cycle Turbines

Dear Ms Smith:

Cinergy appreciates the opportunity to comment on EPA's Draft Guidance on BACT for NOx Control at Combined Cycle Turbines (FR Vol. 65, No. 160, August 17, 2000). We feel that we have some interesting perspectives to offer the agency on this topic. Cinergy owns and operates over 12,000 MWs of fossil fired generation including over 2,000 MWs of combustion turbines (CTs). We operate several different types of CTs with various types of NOx control, including Dry Low NOx burners (DLN) and Steam Injection.

Exhibit 1 in the guidance document quantifies NOx emissions from different types of electric generators. We suggest that EPA should also investigate and quantify emissions from the processes that occur as a result of operating an SCR. For example, operating an SCR requires the use of ammonia. Ammonia is a part of the chemical reaction that reduces NOx to water vapor and molecular nitrogen. Manufacturing ammonia most often uses natural gas as a feedstock as part of a steam reforming process. This process strips the hydrogen from the methane and water molecules while oxidizing the carbon to carbon monoxide. The carbon monoxide is later converted to carbon dioxide. The hydrogen combines with molecular nitrogen under very high pressures and temperatures to form ammonia. Ammonia can be further reacted to form urea. Overall the process is very energy intensive, requiring about 30-35 GJ of energy per ton of ammonia produced (28.45 mmBtu/ton).[1] More over the process also generates significant amounts of carbon dioxide. For each ton of ammonia produced, about 2.6 tons of CO2 is produced. When calculating the total emissions that result from operation of an SCR, the amount of carbon dioxide emitted from ammonia manufacturing is based on the total amount of ammonia consumed by the SCR, not the ammonia slip. However when operating an SCR to control very low levels of NOx, the ammonia slip as a consequence can be of the same magnitude as the amount of NOx emitted by the turbine.

Another important issue is which type of combustion turbine a company chooses to build based on the requirements of a BACT determination. If a company is required to install an SCR with the CT, the economics often do not favor purchasing a machine with Dry Low NOx (DLN). Rather, it would be more economical to purchase a machine without DLN and a higher initial NOx emissions rate (such as the 25 ppm CT referenced in the guidance document) and then using the SCR to reduce final NOx emissions to the levels of 2.5-4.5 ppm NOx referenced in the guidance document. This will result in modest increases in operating and maintenance costs for more ammonia and catalyst, but it would lower the initial capital costs. The result however will be a significantly higher consumption of ammonia and more non-NOx emissions. However if the extra cost of an SCR required by a BACT analysis causes a combined cycle plant to not be constructed, then the power would likely be produced instead by a coal fired unit such as those referenced in the document. This would result in still higher levels of ammonia consumption assuming the unit operates with an SCR, plus any other resulting emissions such as SO2, etc.

When planning for new generation and evaluating potential emissions, one must consider these issues together. For example compare the results of a combined cycle unit operating with DLN burners and no SCR, and another unit that is required to install SCR and reduce to3.5 ppm NOx. The permittee would likely choose a machine that operates at 25 ppm of NOx for this second option. While the unit operating an SCR would have lower NOx emissions (60 tons per year vs. 150 tons per year), it would also consume 233 tons of ammonia and result in about 21 tons of ammonia slip (assuming slip is 10% of the ammonia consumed for reducing NOx). The ammonia production would result in over 600 additional tons of carbon dioxide, and 6,500 mmBtu of energy consumption.

In addition, exhibit #1 references typical NOx concentrations in ppm for the flue gas from coal-fired steam electric and combustion turbine units. It should be pointed out that NOx concentrations for coal fired boilers are often referenced to 3% oxygen while combustion turbines are referenced at 15% oxygen. These numbers should reference the flue gas oxygen contents there are referenced to. Cinergy recommends the guidance document be expanded to recognize and quantify these and related issues. We hope our comments are of use and would be willing to further discuss them with you. If you have any questions, please contact me at (513) 287-3839.

Sincerely,

J. Michael Geers, P.E.
Senior Engineer
Cinergy Corp.

Encyclopedia of Chemical Technology, 4 edition, Kirk-Othmer, Wiley Interscience, pgs 638-689

Document 32

Reference: 65FR50202, "Consideration of Collateral Environmental Impacts Associated with the use of SCR at Dry Low NOx Combined Cycle Natural Gas Turbines"

Dear Ms. Smith:

The New Jersey Air Quality Regulation program concurs with the comments submitted by the Dayton, Ohio, Regional Air Pollution Control Agency. We also belileve that the ammonia slip issues for SCR can appropriately be addressed as part of the normal top down BACT review. We also apply more weight to the safety issue than the emission issue for ammonia, particularly in densely populated areas where ammonia storage and handling would be very near residential areas.

Concerning possible use of 9 ppm as a " presumptive BACT", we believe that lower levels, in the 2 to 5 ppm range, are more appropriate for a presumptive BACT, given the factors discused in the quidance document. In particular, note that actual ammonia emissions are usually only a fraction of the allowable ammonia slip, while the NOx emissions are typically much closer to the allowables. Consequently, the tradeoffs for ammonia and NOx emissions should be compared based on expected actual emissions obtained from actual monitoring.

Also, presumptive BACT could be used for EPA oversight purposes, but should not be a quarentee of approvability or denial of BACT by the local or state agency. The local or state agency may determine that a lower or higher level of NOx is BACT for a specific project based on the factors discused in the quidance. EPA focus of their oversight role on higher levels is appropriate, but such oversight should not result in an automatic dissapproval of higher levels.

Finally, BACT for such source categories is best evaluated on an output basis, ie lb of NOx per MWhr in this case. This appropriately incorporates energy efficiency into the BACT comparisons, so that alternative energy producing equipment can be evaluated as part of BACT.

Thank you for your consideration of these comments.

William O'Sullivan, P.E.
Administrator, Air Quality Regulation Program
NJ Department of Environmental Protection
401 East State St, Trenton, NJ 08625

Document 33

Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, North Carolina 27711

Dear Ms. Smith,

Siemens Westinghouse Power Corporation has prepared comments to the **EPA "Position Paper" "NOx Control on Combined Cycle Turbines" dated August 4, 2000 (the "Position Paper"); EPA Memorandum "Consideration of Collateral Environmental Impacts Associated with the Use of SCR at Dry Low NOx Combined Cycle Natural Gas Turbines (the "Guidance Document")" which were listed in the Federal Register on August 17, 2000.** We first want thank the EPA for providing others and us the opportunity to comment upon these documents. Siemens Westinghouse Power Corporation ("SWPC") is a manufacturer of large power generation equipment, and it typically supplies over 30% of the new installation of gas turbine megawatts each year in the United States. We would hope that EPA would give serious attention to our comments and concerns. We are happy to provide any additional clarifications or information.

The EPA Guidance Document suggests that a combined cycle plant that can operate at a NOx concentration of 9 ppmvd corrected to 15% O2 ("ppm") or less utilizing a particular technology may not require Selective Catalytic Reduction ("SCR"), whereas a plant above 9ppm would continue to require an SCR. This position is different than current practice where the EPA Regional Offices establish their own assessments of BACT in each case, and have done so, traditionally, by applying the most stringent emissions requirements which each deem appropriate, given the particular circumstances involved. In some cases, this has led to the use of the so called "Dry Low NOx" combustion systems ("DLN") which are internal to the gas turbine design and minimize the creation of NOx and also to the use of selective catalytic reduction (SCR) systems which remove NOx from the exhaust of the plant prior to release into the atmosphere. DLN combustion systems are inherently specific to a particular engine design and will result in various NOx emission rates related to the operating parameters of an engine. SCRs can be readily included in almost any new combined cycle plant regardless of the engine manufacturer. All current production engines for Siemens Westinghouse typically use lean premixed DLN and are offered at NOx levels ranging from 9ppm for a less efficient engine, 15ppm for advanced engines, and at 25ppm for the state of the art ultra high efficient engines. All of these engines can be used in combined cycle applications and utilize SCR to further reduce the NOx level leaving the exhaust stack to a concentration level of 3.5ppm NOx.

EPA does not cite any compelling need for the documents. We are not convinced that any guidance in this area was or is necessary, and the documents proposed by EPA do not persuade us otherwise. We note that EPA does not cite any confusion, inconsistency, or misinterpretation within or among the various regions and permitting authorities regarding the application of the existing BACT standards. Though not expressly stated as such, one justification which does emerge is that one Original Equipment Manufacturer ("OEM") claims it has invested substantially

(apparently, according to the Position Paper, at least partially at the Government's expense) to develop DLN technology, and that such investment should be considered. SWPC (and other vendors, we presume) have similarly invested millions of dollars in DLN combustion technology and offers low emission, reliable products on all new engines. We do not think that investment should drive the issuance of the draft of the "Guidance Document".

Additionally, we note that the technical basis for the Guidance Document lies in the fact that a particular OEM claims it will "conditionally" guarantee 9ppm NOx. Yet, the Guidance Document does not explain why a "conditional" guarantee of a NOx concentration alone justifies a Guidance Document to be issued. Guarantees by any OEM for a particular plant are already considered by the purchaser of a gas turbine when it seeks a permit and do not require special Guidance Documents to be issued.

We request that the Position Paper and Guidance Document both be rescinded, and that the permitting entities continue to make decisions on a case by case basis as they have in the past as to the application of BACT in a particular situation. Should EPA still feel a need to issue guidance in this area, then, the agency should pursue these issues through formal rulemaking. We offer comments in no way endorsing the documents, or the need for them. We would however hope that the comments provided below are considered and reflected in any document if they are issued.

If EPA issues such Guidance Documents, then in our view they need to be much more comprehensive than the current draft of the Position Paper and Guidance Documents, and in particular based upon a more thorough investigative study and analysis than is apparent in the documents as currently drafted. As we illustrate with some of our comments below, EPA has not appropriately considered the breadth of factors which need to be considered and addressed, and the level of research which must be done, to provide fully effective and balanced guidance. And we question why BACT guidance would be considered on a single NOx concentration alone, as opposed to other regulated pollutants.

SWPC further notes that, while intended to be a "guidance document", the only guidance offered appear to be several "bullets" appearing on pages 6, 7 and 8. Even those provisions only indicate some "important factors" to consider when weighing the various alternatives. Those factors would appear to be fairly obvious, and we are not persuaded that the regions and permitting authorities are not already using those and other factors to make sound BACT determinations. We are concerned that the message that will be conveyed from the remaining pages of the documents will be very negative regarding SCR systems and technology. We do not think EPA necessarily intends such a conclusion since SCR technology is widely accepted in the industry.

One of the major factors discussed in this paper assumes that the tradeoff of NOx and ammonia may justify allowing plants to operate at higher NOx levels. There is no technical justification of this conclusion offered by EPA. In the documents, it appears that the EPA imposes its own subjective assessment of various "facts" which it advances, including the combined effects of ammonia slip and very low NOx. The documents also suggest that the performance and cost impacts of an SCR would discourage the installation of new combined cycle plants and, as a result, older higher NOx producing power generation equipment would continue to operate. The Position Paper includes a table (Exhibit 2) that suggests that by year

2010 more NOx will be generated if SCR is required on 9ppm NOx applications than if SCR is not used. However, contrary to EPA's views, we have concerns that the information provided in the Guidance Document will have the counter effect of increasing emissions from new plants and drive power producers to select products that are neither the most efficient nor lowest emission options.

The tradeoff between NOx and ammonia has not been sufficiently studied to allow the conclusions proposed in the Position Paper and Guidance Document. In each of these documents, the EPA acknowledges that the tradeoffs between NOx and ammonia are not simple, yet draws conclusions based on the limited information, none of which is technically supported, and much of which can be easily contested. The Guidance Document, while clearly focused on the benefits of DLN technology, stops short of declaring that SCR should not be used. It suggests that a BACT analysis can reasonably conclude that a facility using combustion turbines producing 9ppm NOx without an SCR provides a better environmental result than a 3.5ppm facility that employs an SCR. Clearly, however, before a presumptive BACT NOx concentration level can be selected, a comprehensive technical study must be conducted that would establish the actual tradeoffs and impacts of ammonia and NOx. For example, the combined weight of NOx and ammonia emitted for a combined cycle plant with an SCR is approximately half of a combined cycle plant that operates at 9ppm NOx without an SCR. This fact, along with a number of other important factors, is not considered by EPA in the Guidance Document.

EPA ignores other Non-SCR based technology and approaches. EPA fails to take into consideration that other OEM's, with or without government expense, have similarly invested substantial sums to achieve DLN technology. Yet EPA would set an arbitrary standard and reward one particular vendor for past efforts that result in claimed achievement of 9ppm NOx. SWPC, for example, offers high efficiency gas turbines that can operate at 15ppm with DLN. There is no technical justification offered by the EPA that supports allowing a level of 9ppm NOx which is 5.5 ppm higher than the level with an SCR. The EPA apparently has concluded that the difference between 3.5 ppm and 9 ppm is not significant or substantial. An identical argument can therefore be made with respect to the difference between 9 ppm and 15ppm. Many regions and states have already studied the BACT application of SCRs to reduce 9ppm engines to 3.5ppm plants and have concluded that the BACT analysis supports just the opposite; that these differences are material.

EPA's statistical analyses are based on outdated and inappropriate models. The assumptions underlying EPA's statistical analyses appear to be based on a historical regulated market, whereas the actual market is now largely deregulated. The Integrated Planning Model ("model") that utilities have traditionally relied upon to forecast the need for new generation were not economic models, but reliability models that are demand based. They predicted the need for generation and then matched up the existing generation facilities against the need to determine the new generation required. The forecasting relied upon the traditional load growth of 3-5 % per year and used historical weather data to correlate the peak demands. The variable generation costs have not traditionally been well segregated from the fixed costs, since utilities earned rates of return based on the fixed costs. This led to variable costs being low and fixed costs high. The models were limited in their ability to predict off system purchase and sales to balance

generation and need outside of the system studied. Overall, the models predicted the amount of new generation required, solely on the level of reserve margin that existed.

With the onset of deregulation, the traditional model no longer applies because the economics of generation are now the predominant driver in the decision of what plant will run. The true fixed and variable generation costs are now considered the total cost of generation, and are the only determinant on whether a plant will operate. The investments currently made are based on the market positions that the companies are building, and not a theoretical variable cost. This led to developers investing in new plants based on their projections of what the ultimate market prices will be, and investing in new generation far in excess of the traditional models. The current market is over an order of magnitude above the historical regulated market projections; thus the regulated market projection should not be used to reach the conclusions proposed in the paper. The data reported in exhibit 2 is very misleading since it suggests that less NOx will be produced in year 2010 if SCR is not used on 9ppm NOx combined cycle plants. This ignores that more efficient plants, which use an SCR, are available and should be preferred over other kinds of plants.

EPA ignores other major factors, such as efficiency and reliability, in the Guidance Document. Identifying a single NOx concentration gives excessive credence to the NOx level and ignores other critical factors such as efficiency, availability, reliability, fuel flexibility, maintainability and others that would be expected to have a much larger impact on the operating cost and hence the dispatch hours on a plant than a SCR. There are more efficient gas turbines offered by OEM's including SWPC than those offered at 9ppm. The impact of an SCR on the performance level of a plant is trivial compared to the efficiency that can be achieved by applying a more efficient gas turbine. The performance impact of an SCR on a combined cycle is less than 0.1% in efficiency, an extremely minor impact when compared to the many factors that effect the dispatch frequency of a plant.

For instance, in one OEM's published literature, the efficiency of a combined cycle plant with an engine offered at 9ppm is 1.3-percentage points worse than its engine that emits 25ppm NOx (56% versus 57.3%). SWPC has plants rated at 58% efficiency that combined with an SCR are designed to operate in the range of 3.5-ppm NOx. Additionally, using concentration of NOx as the sole basis for this determination is not consistent with overall emission concerns. Unless efficiency is also included in the analysis, carbon dioxide, hazardous air pollutants, and other emission impacts are ignored.

Defining 9ppm as acceptable for combined cycle plants will discourage development of lower emission technologies that could attain lower NOx levels without SCR such as catalytic combustion. For instance, in collaboration with the Department of Energy, SWPC is investing millions of dollars in the development of catalytic combustion technology with the goal of achieving NOx levels as low as 3.5ppm internal to the engine and without an SCR. The driving force for this development is to achieve NOx levels without an SCR equivalent to what can be currently achieved with an SCR. If the EPA suggests that 9ppm NOx can be considered equivalent to 3.5ppm NOx, there will be no incentive to continue the development of a 3.5 ppm combustor. This would be contrary to the EPA goal of reducing the formation of NOx.

Finally, the EPA Guidance Document ignores that fact that emission control can begin at an earlier point in a startup and shutdown with an SCR than without, which helps reduce the overall emissions from a combined cycle plant. One of the factors that determine the effectiveness of an SCR is the exhaust temperature of the gas turbine. NOx reduction with an SCR can typically begin as low as 35% load, whereas DLN combustors typically cannot control to low NOx until at least 50% load. Thus, an SCR will assist in minimizing the overall NOx emissions for plant operation compared to DLN combustion alone by reducing the NOx concentration during startup and shutdown over a wider operating range and with lower concentration levels.

Another important factor is that DLN combustion systems typically are designed to minimize NOx on natural gas fuels and operate at higher NOx levels with alternative gas or liquid fuels. Combined cycle plants with SCR can reduce the NOx levels regardless of the fuel.

In summary, Siemens Westinghouse Power Corporation objects to the proposed Guidance Document; it questions the regulatory and legal basis upon which this document is issued; it notes that the guidance document is flawed both from the technical justification for the DLN standard it espouses, as well as the statistics which it uses to support its fairly vague and limited "guidance". Accordingly, Siemens Westinghouse requests that EPA withdraw this "guidance". If EPA believes that guidance on this subject is necessary, SWPC proposes that EPA consider a broader analysis of BACT issues while taking into account a more complete spectrum of NOx control technologies and gas turbine manufacturers and proceed through a formal rulemaking process. We look forward to working cooperatively with EPA to address these points and any other topics that affect the power generation industry.

If you have any questions, please feel free to contact me at 407-736-2283.

Sincerely,

/s/

George A. Schott, Manager
Systems Integration and
Environmental Engineering

Document 34

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202/789-7200
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September 18, 2000

Ms. Pamela J. Smith
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards (MD-12)
Information Transfer and Program Integration Division
Research Triangle Park, North Carolina 27711

Re: Use of SCR at Dry Low NOx Combined-Cycle Natural Gas Turbines

Dear Ms. Smith:

The Electric Power Supply Association (EPSA) is pleased to provide comments on EPA's August 4, 2000 draft guidance on best available control technology (BACT) for NOx control at dry low NOx (DLN) combined-cycle natural gas turbines ("draft guidance").

EPSA is the national trade association representing competitive power suppliers, including independent power producers, merchant generators and power marketers. EPSA members provide reliable, competitively priced electricity from environmentally responsible facilities in U.S. and global power markets. EPSA seeks to bring the benefits of competition to all power customers. In terms of environmental protection, EPSA supports policies that value the environmental benefits of newer and cleaner sources and are consistent with the emerging competitive electricity market. A list of our members is attached to this filing for your information.

EPSA's members include those companies that are most actively developing new electricity generating capacity in the U.S., nearly all of which is natural gas fired, and thus have a particular interest in the draft guidance.

General Comments

EPSA appreciates and supports EPA's consideration of the collateral environmental impacts associated with certain selective catalytic reduction (SCR) applications. EPSA also supports EPA's reasoning and conclusion that SCR should not be required in cases in which collateral

environmental impacts compromise the technology's overall air quality benefits. EPSA urges EPA to formally adopt the policies embodied in the draft guidance, with certain modifications which are discussed below.

More generally, EPSA appreciates and supports the conceptual approach that is reflected by EPA's draft guidance. While the new source review program, including BACT requirements, is designed to protect air quality, the increasing complexity and interaction of control technologies in some operating scenarios may cause certain control strategies to be more effective than others in counter-intuitive ways. The scenario discussed in the draft guidance is an excellent example of a technology requirement that may compromise the environmental benefit that it is intended to produce. EPSA believes that EPA's broader use of this conceptual approach would better serve the agency's environmental and public health objectives, while producing benefits to the economy by reducing investment in redundant and/or counterproductive control technologies.

EPSA encourages EPA to use this approach in evaluating the effectiveness of other regulatory programs and requirements to ensure that they yield their intended benefits. In fact, EPSA believes that EPA policy should be modified to require permitting authorities to consider information submitted by permit applicants regarding the effectiveness of control technologies in the specific context of their use in practice.

Specific Comments

The draft guidance, as written, would apply only to DLN combined cycle turbines in attainment areas. The same sound logic that supports the consideration of collateral benefits for such turbines also supports the consideration of such benefits (1) at DLN simple cycle peaking turbines and (2) in nonattainment areas. Also, as the agency considers the appropriate role of collateral impacts, it is important to consider potential inconsistencies in how their evaluation may be conducted in practice by permitting authorities. Each of these issues is discussed, in turn, below.

First, it is unclear why the draft guidance applies only to combined cycle plants. In fact, the collateral impacts of applying SCR at DLN simple cycle peaking facilities are greater than those at DLN combined cycle plants. The extremely high incremental cost of NOx removal associated with the use of SCR on peaking units makes the economic impact of requiring SCR even more detrimental to peaking plants.

In cost estimates developed for BACT analyses, the cost per ton of NOx removed using SCR on simple cycle peaking units is approximately four times the cost per ton removed using SCR on combined cycle base load units (approximately $40,000/ton versus $10,000 to $12,000/ton). This is because the large capital cost is still required, but much less NOx is removed due to the reduced hours of operation typical for a peaking unit. Further, the typical SCR design won't work

on a simple cycle unit without modifications such as cooling the exhaust gases or using high temperature catalyst material. Finally, there is an efficiency loss resulting from the use of SCR on a simple cycle unit, as back pressure on the unit from the SCR reduces electrical output.

These impacts diminish the economic viability of simple cycle facilities, and could create an inadvertent disincentive to the development of new simple cycle peaking units, an outcome counter to the best interests of clean air policy. Thus, the use of SCR on simple cycle plants affects plant operation, heat rate and efficiency, interfering with the environmental benefits that would otherwise accrue from the widespread availability of clean peaking capacity. Accordingly, EPSA urges EPA to afford DLN simple cycle plants the same treatment as DLN combined cycle plants when considering the appropriateness of SCR.

Second, it is unclear why the draft guidance addresses only attainment-area sources. Again, the case for consideration of collateral impacts seems even more compelling for other sources—namely, those in nonattainment areas. Collateral impacts that are environmentally detrimental should be of even greater concern in areas that do not meet the national ambient air quality standards. EPSA urges EPA to formally address collateral impacts in lowest achievable emissions rate (LAER) determinations in nonattainment areas, and to encourage their consideration by permitting authorities. Such an action would help to prevent undesirable collateral environmental and public health impacts, as well as unnecessary capital and operational costs that could discourage the development of cleaner sources.

Finally, one issue introduced by the guidance is the potential for inconsistency that is introduced by the evaluation of collateral impacts. Recently, the BACT evaluations conducted in different states have begun to converge, after a period in which significant differences were experienced. The draft guidance issued regarding collateral impact analysis should therefore be as specific as possible. For example, the draft guidance discussed the observed ammonia slip rates as compared to the permitted slip rates. If the analyses are made using the permitted rates, the collateral impacts from ammonia slip will be overstated and could lead to rejection of SCR when its selection would, in reality, have a greater environmental benefit. EPA should make every effort to ensure that the implementation of this guidance is consistent across jurisdictional boundaries, or significant differences in implementation could again arise.

Conclusion

EPSA appreciates the agency's consideration of these important issues. We urge EPA to continue to encourage greater consideration of collateral environmental impacts, including by permitting authorities. We also urge the agency to provide the same consideration of collateral impacts for DLN simple cycle plants as DLN combined cycle plants, and for plants in nonattainment areas as for those in attainment areas. We are available at your convenience to provide further comments on these issues.

Sincerely yours,

/s/

Lynne H. Church
President

Document 35

The BACT guidance is accurate and appropriate. It correctly interprets the law and provides a balanced perspective on tl

Document 36

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661-392-2630 661-392-2990

FAXED AND MAILED ON:

TO-893

September 20, 2000

Ms. Pamela J. Smith
Information Transfer and Program Integration Diviosn (MD-12)
Office of Air Quality Planning and Standards
US Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Re: **Comments on the Draft Nox Control Policy for Combined Cycle Turbines**

Dear Ms. Smith;

Texeco Domestic Asset Management (TDAM) appreciates the opportunity to comments on the proposed new policy regarding EPA's interpretation of Nox control on combined cycle turbines. This policy seems well thought out, and addresses the major concerns of industry regarding the use of ammonia to control a pollutant that has already been reduced to barely detectable limits.

Texeco agrees with the argument that states, "SCR, when used with dry low Nox turbines would limit Nox emissions to below the level of dry low Nox turbine alone, ... it may be environmentally preferable to operate these turbines without SCR." DLN technology can limit Nox emissions to below 9 ppm, but the added benefit of lowering the Nox emissions to below 5 ppm, while producing an ammonia slip of approzimately 10 ppm, is not environmentally friendly. Ammonia is as harmful a pollutant as Nox, and the reduction of a small concentration Nox in lieu of an increase in ammonia emissions does nto seem practical.

The draft policy further states that "[T]he amminia requred for SCR to operate has its own set of environmental problems that outweigh any benefit of the small increment of Nox reduction that is achieved by putting SCR on dry low Nox turbines." The dangers assocated with the handling of ammonia could be eliminated with the suggestions of this policy. Due to the large throughputs at new combined cycle turbines, a large supply of anhydrous ammonia is necessary. Anhydrous ammonia has been listed as a chemical in the RMP program, and

it presents the possiblity of acute dangers to employess as well as the surronding community. The removal of this potential hazard is a true environmental benefit.

New combined cycle turbines will most likely replace less efficient, hight polluting forms of electrical production. However, the more expensive the project, the less likely it will be built due to low rate-of-returns. Therefor, if the construction and maintenance of a new power producing facility becomes too high, it will not be built, and the less efficient, hight polluting units will remain in operation. The cost effectiveness of the pollution controls must be weighed as a factor in determining BACT.. BACT must be determined on a case-by-case basis.

Finally, we believe this policy should be consistent between all regions of the US EPA. In California, BACT is still listed as DLN technology combined with ammonia injection. As mentioned previously, ammonia injection is not always practical, due to the ammonia slip. Dry low Nox technology that can reach a level of 9 ppm Nox where the use of SCR is not cost effective or is not environmentally practical, should be considered BACT on its own.

If you have any questions regarding the following comments, please do not hesitate to contact Daniel Beck at (661) 392-2461 or Mervyn Soares at (661) 392-2643.

/s/

DLB:plc

Document 37

COMMENTS OF XCEL ENERGY
TO THE ENVIRONMENTAL PROTECTION AGENCY
ON:

NOx CONTROL OF COMBINED CYCLE TURBINES
Issues Regarding the Use of Selective Catalytic Reduction in Attainment Areas for Dry Low NOx Natural Gas Combined Cycle Turbines

PUBLISHED FOR COMMENT ON AUGUST 4, 2000

COMMENTS SUBMITTED TO:

Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, North Carolina 27711

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September 18, 2000

Questions regarding these comments should be addressed to:

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About Xcel Energy:

Xcel Energy Inc. (NYSE:XEL) is a prominent U.S. electric and natural gas utility with annual revenues of nearly $7 billion and operations in 12 Western and Midwestern states. Formed by the merger of New Century Energies and Northern States Power Company, Xcel Energy provides a complete portfolio of energy-related products and services to 3 million electricity customers and 1.5 million natural gas customers. One of the company's nonregulated subsidiaries, NRG Energy, Inc. has projects or offices in 25 states domestically and 10 countries worldwide.

The customer comes first at Xcel Energy. The company's name reflects Xcel Energy's core value—to deliver excellence in energy products and services to customers. The people of Xcel Energy are committed to providing customers the best in service, value and information that will help improve their business and personal lives.

Comments

Xcel enthusiastically applauds the practical approach in the proposal. On several combined cycle (CC) projects reviewed by Xcel personnel, addition of SCR to an operating system has been reviewed, and it was not apparent that the reduction in emissions of NOx would have been either cost-effective or environmentally beneficial. These projects had insignificant ambient impacts without the addition of SCR. In such cases, attainment of ambient air quality goals is not at issue, and PSD increments are not significantly impacted. Therefore, the addition of SCR for NOx control is of questionable value, both economically and environmentally. These comments are especially relevant in light of the collateral impacts described by EPA in this paper. The collateral impacts include negative environmental, energy, and economic impacts.

If you assume that 112,161 MW of new CC plant capacity will be built through year 2010 (from EPA's analysis), at an average of 150 MW each, and that the catalyst has a life of 7 years, then a total of approximately 750 CC plants will be disposing of an additional 107 catalyst beds per year by 2010. These catalysts represent a significant disposal effort, and significant capital investment and replacement costs. As predicted by the Integrated Planning Model in EPA's study, it is likely that more generation from conventional steam plants will occur due to the higher cost of NOx controls on new CC generation, and the total nationwide NOx emissions will be higher than if SCR was not required.

Xcel encourages EPA's consideration of the potential safety problems and regulatory burdens of handling ammonia, in conjunction with the other factors involved in selecting BACT. Ammonia is stored onsite as a gas or as a concentrated solution of ammonia in water. These chemical storage activities require additional manpower and resources to comply with chemical release planning, process safety management, and response management plan requirements that would not otherwise be required. The amount of time and expense involved in complying with these regulatory burdens is not trivial. While chemical release accidents involving ammonia releases should be rare, it is credible that such releases could occur and endanger the general public as well as power plant operation personnel. A terrorist attack on an ammonia storage tank is also considered a credible scenario under the Risk Management Planning program, and could result in serious consequences. These scenarios do not exist

when SCR is not required. It is unlikely that the true costs associated with such regulatory burdens are being included in the economic analyses typically used for BACT determinations.

Ammonia manufacturing is an energy intensive business, which should be evaluated as a negative impact on the decision to use SCR. Plants required to use SCR need ammonia, which requires additional electricity generation and natural gas combustion to support its manufacture. Thus, additional emissions are released in order to support the manufacture of ammonia used to reduce NOx emissions. These emissions are primarily displaced to the location of the ammonia plant. Ammonia manufacturing typically releases from about 0.5 tons up to 1.7 tons of CO2 per ton of product, depending on the amount of CO2 vented from the CO2 removal process, and whether the CO2 can be recycled for other processes onsite. Ammonia manufacturing releases 1.3 to 2.8 pounds of NO2 per ton of product. One ton of ammonia production requires energy input from burning natural gas of about 25 million Btu (equivalent to 25,000 cubic feet natural gas) and uses an additional 20,000 cubic feet of natural gas as feedstock.

For illustrative purposes, the following table shows results of calculations made to compare the collateral impacts of ammonia production and releases from SCR operation versus those same emissions without SCR.

Hypothetical Combined Cycle Plant (approx. 150 MW)

Pollutant	Uncontrolled Emissions	DLN	DLN + SCR	Collateral Emissions (difference)
NOx, ppm	75	15	6	-9
NOx, tons/year	1250	250	100	-150
NH3 slip, tons/year	0	0	15	+15
NH3 slip, ppm	0	0	7.5	+7.5
CO2 increase, tons/year	0	0	37 to 126	+37 to 126
CO2 effic. Loss, t/yr	0	0	2150 to 4300	+2150 to 4300
NH3 use, tons/year	0	0	74	+74
NOx increase, tons/yr	0	0	+0.5 to 0.9	+0.5 to 0.9

As a result of the use of SCR on the hypothetical plant, an increase in ammonia production of 74 tons per year would be required. Of that total, 15 tons per year would be released to the atmosphere as ammonia slip. In addition, production of the ammonia would cause the release of 37 to 126 tons of CO2 from burning natural gas to make the ammonia. (This would be higher if fuel oil or coal was used.) An additional 3,330,000 cubic feet of valuable natural gas would be used as fuel and feedstock for the ammonia production. Increased energy consumption as a result of SCR pressure drop in the plant would amount to 0.3 to 0.6 percent, increasing fuel use by an additional 40,000,000 to 80,000,000 cubic feet of natural gas. This would result in the release of an

additional 1600 to 3800 tons of CO2 and less than one ton of NOx. All of these emission increases would occur to achieve a reduction of 150 tons of NOx. The increased natural resource use should be given appropriate consideration.

The higher emissions of NOx without SCR would be unlikely to significantly impact ambient air quality or cause any PSD increments to be exceeded. Significant increases in energy use and CO2 emissions would accompany the addition of SCR. Therefore, the environmental benefits of adding SCR would be questionable, at best.

Xcel encourages EPA to consider the sustainability of NOx limits when establishing BACT. Xcel is aware of many projects, which were built with BACT and passed initial performance test, but have maintained those levels with great difficulty and at the expense of equipment reliability and longevity. While it is true that GE will conditionally guarantee some of its turbines to meet 9 ppm, the guarantee only extends to a limited subset of their product line, and only in a new and clean condition. They do not guarantee the continuing capability to meet this level. No other manufacturers have been able to demonstrate levels below 15 ppm using Dry Low NOx burners.

Permit limits based on BACT determinations need to be set so the average performance expected of the plant reflects a reasonable level of operational variability and an allowance for "wear and tear". The current philosophy establishes the short and long term emission limits at the low end of what is achievable, not what is actually representative over extended periods with proper operation and maintenance.

Combustion turbines are highly complex pieces of equipment operating in a continuously variable set of atmospheric conditions and at the wide variety of loads needed to supply electric customers' needs. These varying conditions create extremely difficult control problems that are likely to cause excursions from the ideal combustion conditions needed to achieve very low NOx emissions. As operators are compelled to "retune" units to meet emissions limits (especially at a relatively wide range of load dispatch), these units are forced into unstable operating conditions, which has resulted in damage, even dangerous and explosive "backfires". Nevertheless, the manufacturers have had good success in achieving a near perfect combustion balance. If these units are not able to be operated continuously, in all weather, it should be apparent that older, less environmentally friendly technologies will be dispatched.

Even with this success, the permit limits are being set in a manner which cannot be mathematically justified. That is, they are expected to *continuously demonstrate* the *lowest rates achievable* by specific pieces of equipment. Since this equipment cannot operate in a perfect state of tuning at all times, the emissions actually will be at or *above* the lowest achievable levels.

It would be more realistic to have a two-tiered BACT level. Demonstration of a lower limit could be required through an initial performance test, with a second, higher limit requiring continuous demonstration of compliance. This complication has arisen because of the implementation of CEMS requirements, which were added after PSD regulations were written. The impact of CEMS on compliance determinations has not been taken into account in most BACT determinations.

In spite of these challenges, it is our opinion that in many instances Dry Low-NOx burners are preferable to SCR and should be considered. Under the scenario illustrated above, Dry Low NOx burners, vs. SCR, the practical difference between the two control levels is quite small when collateral impacts are included. At these levels of control, the Law of Diminishing Returns takes effect, and it is clear that the additional emissions reductions are consuming an ever-increasing amount of resources for smaller returns. Xcel encourages EPA to consider more cost-effective solutions to achieve further reductions in NOx and other pollutants.

Similar policy considerations should be adopted by EPA in reviewing BACT for CO emissions. In many cases the burners are capable of achieving CO levels nearly as low as the CO catalyst. We have observed that the emissions of CO have decreased in the duct burner section of some combined cycle plants. In the absence of demonstrable adverse effects on the local ambient air quality, the EPA should not require consideration of expensive catalytic oxidation of CO to CO2. It is possible that the CO catalyst also contributes to formation of fine particulates and acid rain precursors. Specifically, SO2 is oxidized to SO3, which then reacts with moisture in the flue gas or the atmosphere to form H2SO4. The additional SO3 also may generate particulate matter emissions by reacting with ammonia from the SCR to create ammonium sulfate salts. Catalyst disposal should be given the same consideration as SCR catalyst disposal.

Xcel appreciates this venue to approach topics of great concern in its business

Document 38

Pamela J. Smith
Information Transfer and Program Integration Division (MD-12)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, North Carolina 27711

Dear Ms. Smith:

Here are my written comments on the draft guidance document attached below from Mr. John S. Seitz, of your office. I apologize for missing your deadline for comments, but hope you will consider this comment.

In the draft document under "Waste Issues", it is stated that "the use of SCR systems results in spent catalyst waste...This waste is usually not hazardous waste and with proper management, should not create significant environmental impacts. Therefore, waste issues, when taken into consideration with other concerns, add weight to the decision to not require SCR, but by themselves these issues should have very little influence on a decision."

The above statement that this waste is usually not hazardous waste may not be entirely accurate. According to the gas turbine manual written by the California Environmental Protection Agency, Air Resources Board, Compliance Division, dated June 1996, "The catalyst materials contain heavy metal oxides which are hazardous to human health. Vanadium pentoxide, for example, is on the EPA's list of Extremely Hazardous Substances. In California, spent catalyst from SCR is considered to be hazardous waste and the volumes of wastes from SCR are large. The disposal of catalyst is expensive, but some catalyst

manufacturers provide for disposal and/or recycling of the catalyst."

To assist you in your efforts to produce an accurate document, you may wish to contact Eric Patton PE, from the California Air Resources Board, to further discuss the waste issues related to spent catalyst. Mr. Patton is the principal author of the gas turbine manual referenced above. His phone number is (916) 445-5001 and his email address is epatton@arb.ca.gov.

Sincerely,

Barry G. Young
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